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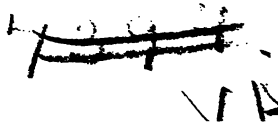

Scott Clegg

Civil Engineer.

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CONTENTS.

ORIGINAL CONTRIBUTIONS.

	PAGE
The Contrast—Mechanical and Children Chimney-sweeping. By Mr. Joseph Glass ..	1
On the Children Chimney-sweeping System. Letter V. By Archibald Rosser, Esq. ..	3
On ditto, with Postscript on the Education of the People. By Junius Redivivus.....	6
Remarks on Courbe's Theory of the Brain. By Mr. William Baddeley.....	9
On the York Column. By R.....	10
Calculation of the Space which would hold all the Generations of Men that have existed since the Creation. By λ.....	10
Remarks on the various Methods of Propelling Vessels by Paddle-Wheels, Plungers, Oars, &c. By D. Landale, Esq.....	11
On the newly-discovered Compounds of Carbon with Hydrogen. By ω.....	13
Description of the Royal Kitchen, Brighton.....	17
Description of Clark's Patent Blower.....	18
On the Children Chimney-sweeping System. Letter VI. By Archibald Rosser, Esq...	19
On Substitutes for Rags in Paper-making. By Mr. William Baddeley.....	21
On Mr. Nutt's System of Bee Management. By Mr. George William Wood.....	23
Description of a Double-bar Lever Pendulum, the Oscillations of which cannot be affected by any Changes in the Temperature of the Weather. By Captain W. Forman, R. N.....	25
On Mathematics and Mathematicians. By Mr. Lewis Frend.....	27
Notice of the Earl of Dundonald's new Motive Power. By C.....	29
Objections to Mr. Howard's Vapour-Engine. By A. Southron.....	30
Reclamation of the Invention of Zincography. By W. A. R.....	31
Description of a Shifting Paddle-Wheel. By Mr. Henry D. Cunningham.....	33
On the Propulsion of Vessels by the Projection of Water from the Stern. By A. S. ..	36
On Barton's Improved Metallic Pistons. By Mr. William Baddeley.....	37
On Isometrical Perspective. By Joseph Jopling, Esq., Architect.....	39
Note on the Vapour-Engine. By Thomas Howard, Esq.....	40
Solution of the Practical Railway Question, vol. xx. p. 432. By Kinclaven.....	40
Remarks on the Earl of Dundonald's New Motive Power, with Postscript on Paper-making. By Junius Redivivus.....	41
Letters on Mr. Kyan's Cure for the Dry Rot. By Mr. John Murray, Mr. Kyan, and Dr. Birkbeck.....	45
Statement of the Performances of the Autopsy and Era Steam-carriages. By Mr. Walter Hancock, Engineer.....	50
On Twin Steam-boats—Mr. Aldersey in Reply to Mr. Landale.....	51
Note, contradictory of a Statement respecting Barton's Metallic Pistons in the Register of Arts. By Dr. Olinthus Gregory.....	53
On Working Inclined Planes. By Mr. J. Deakin.....	54
On the Number of Fires caused by Ignited Flues. By Mr. William Baddeley.....	55
Some additional Particulars respecting Substitutes for Rags in Paker-making. By Enort.....	56
Note on Mr. Murray's Researches into Flame. By John Murray, Esq.....	57
On the Danger to be Apprehended from the Use of Mr. Perkins's Heater. By John Murray, Esq.....	58
Examination of the South Australian Association Scheme.....	58
On the Origin of the Plan for a Breakwater at Portland. By Alexander Lamb, Esq. ..	65

PAGE
Plan for Preventing the Agitation o the Water by the Common Paddle-Wheel. By Mr. William Aldersey 76
On Mathematics and Mathematicians. By Benjamin Cheverton, Esq. 77
On Mr. Hall's Patent Steam-engine Improvements; with Report of Messrs. Lloyd and Kingstown, Government Engineers, and other documents. By Samuel Hall, Esq. 83
On some of the Phenomena of Flame. By ω. 86
On the increasing Use of Iron, Fires from Chimney-flues, Common-road Steam-carriages, &c. By Junius Redivivus 88
Notice of the Chichester Earthquakes. By Henry Watson 90
On a New System of Calculation. By David Booth, Esq. 91
Note on the German Press. By F. H. 92
Description of an Improved Planetarium. By Mr. W. W. Forrester 97
Design of a Rotary-Engine. By a Welshman 100
The Case of the Poor Working Colliers. By U. G. R. 100
Answer to Mr. Murray's Remarks on Perkins's Heater. By A. M. Perkins, Esq. 101
New Mode of Catching Fish 102
Tables of Squares and Square Roots. By David Booth, Esq. 102
On the Expediency of Railways being undertaken by Government. By Mr. William Bowser 106
On Paper-making. By Mr. William Baddeley 106
Practical Hints on Preventing Anchors from Driving. By Colonel Macerone. 107
Note on Messrs. Maudslay and Co.'s Steam-carriage. By S. Y. 108
On the Forcing System as applied to Tanning. By Enort 108
Description of an Improved Floating Engine. By Mr. William Baddeley. 113
Answer to Mr. Lamb on the Origin of the Plan of a Breakwater at Portland. By Mr. John Harvey 115
On the Right Employment of Wealth. By Junius Redivivus 117
On the Practicability of Sailing in the Wind's Eye. By ⊖. 119
Note on Messrs. Sims and Davies's Investigations into the Phenomena of Flame. By A Constant Reader 122
Description of Mr. Birch's Patent Axletree and Box for Carriages 129
On the Exportation of Machinery. By J. C. 131
On the Dangers attending the Use of the Davy Safety-Lamp. By U. G. R. 131
On the Right Employment of Wealth. By J. C. Loudon, Esq. 132
Detection of some Remarkable Plagiarisms in Mr. Nutt's Book on Bees. By J. P. T. 132
Note on the Manufacture of Straw Paper. By Mr. William Baddeley 134
On a proper Site for the New Houses of Parliament. By P. P. C. R. 134
Description of an Improved Stopper for Inclined Planes. By Mr. James Woodhouse .. 136
Reply to Mr. Harvey on the Origin of the Portland Breakwater. By Alex. Lamb, Esq. 136
On the Philosophy of Vegetation. By ω. 139
On Twin Steam-boats. By D. Landale, Esq. 141
On Do. By Mr. E. W. Baker 142
Description of an Apparatus for Showing the Causes of the Seasons. By J. R. Aris, Esq. 145
On Mathematics and Mathematicians. By Mr. Lewis Frend 147
Reclamation of the Discovery of Kyan's Cure for the Dry Rot. By K. W. S. 150
Notice of another Cure for the Dry Rot. By W. W. 151
Proofs that Flame is Hollow. By Mr. Wm. Baddeley 151
Description of a Self-snuffing Candlestick. By Mr. Henry D. Cunningham 152
On the Employment of Caoutchouc as a Lining for Coffins. By E. B. 162
On Axletrees and Axle-friction. By Junius Redivivus 163
Note on the late Conflagration of the Houses of Parliament. By Joseph Jopling, Esq. ... 168
Description of a Compensating Pendulum. By Mr. Benjamin Hurley 169
Description of a New Steam-Wheel. By Mr. James Woodhouse. 177
Description of an Improved Portable Fire Ladder. By Mr. Wm. Baddeley. 184
Abstract of the New Weight and Measure Act, with Remarks. By Enort 185
On Steam Communication with India. By F. H. 187
On Iron Chimney Flues—Machine Chimney-sweeping, and Steam Kitchens. By Mr. James Gilbertson 188
On Manufacturing Ink from Coal. By Enort 189
Description of a Cheap and Effective Water-Filter. By J. F. 189
Description of the Earl of Dundonald's Revolving Steam-engine 193
On Perkins' Heater, Kyan's Dry Rot Remedy, Davy's Safety-Lamp, &c. By John *Murray, Esq.* 197
On the Origin and Cure of Dry Rot. By J. L. S. 198

PAGE
Suggestion for the Improvement of the Footpaths of the London Bridges. By A. 199
On Planetary Wheel-work Calculations. By Mr. E. Henderson 199
On the Extinction of Water-side Fires. By Mr. Thomas Deakin 201
Description of Mr. R. B. Cooper's Patent Jars. By Mr. William Baddeley 201
Remarks on the Paper on Axletrees and Axle-friction by Junius Redivivus, as far as regards Mr. Birch's Axletree. By A Birch Rod 202
On the Explosive Force of Detonating Powder. By J. L. S. 204
Mathematical Investigation of the Undulating Railway Theory. By J. H. Whitehead, Esq. 211
Reply to the Detection of some Remarkable Plagiarisms in Nutt's Book on Bees. By the Rev. Thomas Clark 216
Description of an Improved Twin Steam-boat. By Mr. William Aldersey 225
Answer of Junius Redivivus to "A Birch Rod" on Birch's Axletrees; with a Postscript on the Earl of Dundonald's Revolving Engine 227
On the Philosophy of Vegetation. By ω. 230
Description of some Improved Mercurial Gas-holders. By Henry Watson 232
Supplementary Observations on the Origin of the Plan of the Portland Breakwater. By Mr. John Harvey 233
Description of Messrs. Macerone and Squire's Steam-Boiler 241
Reply to Mr. Murray's Animadversions on Davy's Safety-Lamp. By U. G. R. 244
Remarks on the Royal Patent Sea-Water Purifying Company. By Mr. E. W. Baker. 246
On Stationary Fire-Engines. By Mr. William Baddeley 246
On Shifting Paddle-Wheels. By Mr. H. D. Cunningham 251
On the Right Employment of Wealth. By R. 251
Explanation of the Delay in obtaining a Trial on a large Scale of the Undulating Railway System. By Richard Badnall, Esq. 253
On Mr. Hall's Steam-engine Improvements. By John Braithwaite, Esq., Civil Engineer 260
Remarks on Mr. Whitehead's Mathematical Investigation of the Undulating Railway Theory. By a Lieutenant of Engineers 261
Reply to Junius Redivivus on Birch's Axletree. By Birch Rod 266
On Mr. Harvey's Claim to the Origination of the Portland Breakwater. By John Ham, Esq. 269
On the Use of Detonating Powder. By J. L. 269
Simple and Economical Method of Smoking Hams 269
Description of Morgan's Paddle-Wheel 273
Description of a Chimney that requires no Sweeping. By P. 277
On Mr. Hall's Steam-engine Improvements. By Archibald Rosser, Esq. 278
Easy Method of Drilling Holes in Glass for Philosophical Instruments. By F. H. 279
Answer to Mr. Baker's Remarks on the Royal Patent Sea-Water Company. By J. Wells, Esq. 280
On Paddle-Wheels, Sail-Burners, Shot-proof Ships, and Steam-carriage Boilers. By Colonel Macerone 280
On Pistol-Whips and India-Rubber Whips 284
The Railway Calumniators—Letter from Mr. Cort, with Remarks by the Editor 291
On Mr. Hall's Steam-engine Improvements. By Mr. William Braithwaite 302
Description of an Improved Single-valved Air-Pump. By N. C. 328
Further Remarks on Mr. Hall's Steam-engine Improvements. By Archibald Rosser, Esq. 329
Notice of the Projected New Liverpool and Manchester Railway 333
Description of Symington's Paddle-Wheel 337
On Cunningham's Shifting Paddle-Wheel. By Mashdoud Mohandez 339
Reply of Mr. Cort to the Editor's Remarks on his Railway Calumnies; with Castigation Supplementary 340
On the Railway-dividend Question. By A. L. 343
Experimental Demonstration of the Principle of Mr. Witty's Patent Mode of Propelling Steam-Carriages. By A Working Mechanic 344
Description of a Twin-Boat for Quick Travelling on Canals. By Mr. James Whitelaw, Engineer 346
Exposure of some Mis-statements in the Evidence on Mr. Gurney's Case. By Mr. Walter Hancock 347
Report on London Fires in 1834. By Mr. William Baddeley 349
Further Remarks on Birch's Patent Axle; with a Postscript on Chimneys. By Junius Redivivus 350
The Case of a Poor Inventor 357
On the Undulating Railway System. By Saxula 358

PAGE
Description of a Gun with a Revolving Breech—a Simple Mode of Increasing the Tractive Power on Roads—and a Relief-Wheel for Common Road Steam-Carriages. By the Rev. Robt. Carey 358
On Mercurial Gas-holders, and Weekes's Eudiometer. By W. H. Weekes, Esq. 359
On the Comparative Utility of Wollaston's Camera Lucida, and Burgess's Paneidolon. By One Desirous of Seeing True Merit Triumphant 360
On the Plans of Messrs. Hall, Messrs. Busk, Keene, and Co., and others, for the Condensation of Steam by External Application. By Col. Macerone 366
On the Utility of Pedestrian Tunnels 366
Description of Mr. Russell's Steam-Carriage 369
Remarks on Mr. Wells's Vindication of the Royal Patent Sea Water Purifying Company. By Mr. James Frazer, Engineer 372
On a Difficulty attending the Differential Calculus. By Mr. Lewis Frend 374
On the Railway Dividend Question. By Col. Macerone 375
On the Chimney-Sweepers' Regulation Act. By Arch. Rosser, Esq. 375
On the Condensation of Steam by External Application. By Messrs. Busk, Keene, and Co. With Note by the Editor, and Abstract of Mr. Hall's Specification 376
On Tests for Arsenic. By ω 379
Description of an Improvement in Fire-Tongs. By Rear-Admiral J. Bullen 379
Description of Mr. Russell's Steam-Boiler 385
Report to the Directors of the London and Birmingham Railway, on the Formation of a Railway by Undulatory Planes. By Robt. Stephenson, Esq., C. E. 388
Remarks on the late Parliamentary Steam-Carriage Inquiry. By H. 392
Answer to the former Remarks of Junius Redivivus on Birch's Axles. By Birch Rod. . 393
On the Comparative Cost of Candle and Gas Light. By J. O. N. Rutter, Esq. 395
Description of Warne's Patent Improvements in Pumps. By Mr. Wm. Vere, Engineer 417
Description of some Improvements in Steam-Boat Machinery. By Mr. James Whitelaw, Engineer 410
Reply to the further Answer of Birch Rod, on the subject of Birch's Axles. By Junius Redivivus 421
Note on the Chimney-Sweepers' Regulation Act. By Do. 423
Note on Condensing Steam by External Application. By Messrs. Busk, Keene & Co. ... 423
Description of Penny's Stationers' Cutting Press. By Mr. Wm. Baddeley 434
Official Reports of the Performances of the Quick Passsage-Boats of the Lancaster Canal 435
On the Line adopted for the London and Birmingham Railway. By Edward Grantham, Esq., Civil Engineer 436
Remarks on Mr. Gurney's Case. By Verax 438
Strictures on the Government Loan for the Completion of the Thames Tunnel 439
Description of an Improvement in the Fire-bars of Locomotive Engines. By Mr. J. R. White 441
On the Chimney-Sweepers' Regulation Act. By Arch. Rosser, Esq. 442
Reply to Mr. Harvey's Supplementary Observations on the Origin of the Plan of the Portland Breakwater. By Alex. Lamb, Esq. 442
On Steam-Carriages on Common Roads, Mr. Witty's Patent Mode of Propulsion, and Mr. Gurney's Claims. By Saxula 444
On Mr. Rob. Stephenson's Report on the Undulating Railway System. By Saxula .. 453
On Mr. Whitehead's Mathematical Investigation of the Undulating Railway System, and Mr. Stephenson's Report. By Mentor 454
On Mr. Stephenson's Report on do. By Iver Maciver 455
Correspondence on the Subject of a Charge of Misrepresentation brought by the Editor against Ld. Brougham, in regard to the Rise of Mechanics' Institutions in England 457
On "Credit Pernicious." By Arch. Rosser, Esq. 463
Description of M'Curdy's Patent Propeller. By John M'Curdy, Esq. 465
On Planetariums. By Mr. Wm. W. Forrester 466
Description of a Simple Perspective Delineator. By Mr. Wm. Shires 468
Last Reply of Birch Rod to Junius Redivivus, on Axletrees 468
Materials for a Memoir of Samuel Clegg, Esq., C. E., and Authentic History of Gas-Lighting. By L. L. 470
Description of Penny's Improved Stationers' Ploughs, By Mr. Wm. Baddeley 473
Sequel to the Brougham Correspondence 474
On Securing Steam vessels against the Effects of Violent Concussions. By Mr. Wm. Aldersey 477
Cost of Locomotive Steam-Power 477
Paddle-Wheel Reminiscences. By Scrutator Mechanicus 478

REVIEWS AND CRITICAL NOTICES.

	PAGE
Description of South Australia	58
The Penny Cyclopædia	123, 135
Mr. Loudon's "Arboretum Britannicum"	144
Almanacs for 1835	152, 176
British Scientific Association—Third Report	220
Illustrations of the Natural History of the Himalayan Mountains. By J. Forbes Royle, Esq.	235
Treatise on Elemental Locomotion. By Alex. Gordon, Esq., C. E. 2d edition	262
Dr. Lardner's Treatise on Heat	320
Records of General Science. By Robt. D. Thomson, M.D.	334
Reports of Chas. Vignoles, Esq., C. E., and Joseph Locke, Esq. C. E., on the projected New Liverpool and Manchester Railway	362
Nautical and Hydraulic Experiments. With numerous Scientific Miscellanies. By Col. Mark Beaufoy	380
Bibliopegia, or the Art of Bookbinding. By John Andw. Arnett	400
Treatise on Isometrical Drawing, &c. By T. Sopwith	412
The Penny Magazine	420
History of the Cotton Manufacture. By Edw. Baines, jun., Esq.	434
The Cabinet Cyclopædia	444

EXTRACTS.

On the Resistance of Hollow and Solid Cylinders. By M. Parent	26
Reason why Cats always alight on their Feet. By Mr. Rennie	31
Description of Professor Hare's Apparatus for Making Ice	33
Opening of the Dublin and Kingstown Railway	47
On the Plurality of Worlds. By Prof. Moseley	92
Specification of Barden's Twin Steam-Boat	93
On the Colouring of the Bones by Food. By Dr. Roget	107
Continental Railways	109
American do.	125
Essay on the Progress of Men in the Useful Arts. By Mr. Ed. Sang	178
Shaft-sinking at Monkwearmouth Colliery	182
Evidence of Mr. William Reed on the Performances of the Liverpool and Manchester Railway Steam-Carriages	190
Russian Calculating Boy	191
Mr. Pritchard on the Circulation in Microscopic Objects	204
Brooks's Domestic Silk-spinner	209
Preston's Improved Millstone	219
Official Documents respecting the Railroad across the Isthmus of Panama	247
Experiments on the Strength of Cordage	250
Description of Fairman's Rotary and Reciprocating Steam-engine	257
Register of the Weather during 1834	270
Reports of the Committee of the Franklin Institute, on Kite's Railway Car, and Campbell's Spirit Level	282
Description of Sebastian's Machine to prove the Proportion of the Fall of Bodies	282
Notice of Stereotype Metalagraphic Printing	283
Explanation of some Singular Optical Effects. By M. de la Hire	283
Description of the Dublin and Kingstown Railway-Carriage "Hibernia"	289
Report of the Select Committee of the House of Commons on Mr. Goldsworthy Gurney's Case; with Abridgment of the Minutes of Evidence	303, 322
Description of Weeks's Patent Cooking Apparatus	321
Sixth Half-Yearly Report of the Liverpool and Manchester Railway Directors	330
Parisian Exhibition of Macerone and Squire's Steam-Carriage	394
The Portland Breakwater and Communication with the South of Europe	408
Report of the S. Carolina Railroad Directors	440
Preparation of Bistre	442
Description of Grant's Biscuit-Baking Apparatus	449
Proceedings in the House of Commons on the Pension to Professor Airy	467

NEW PATENTS.

British ..... 63, 109, 223, 286, 415, 479 American 13, 109, 204, 284

NOTES AND NOTICES.

Disfigurers of Architecture	15
Burlington Arcade	15
New State Paper-office Chimneys	15
Zincography	16, 128
Mortality from Fire and Choke Damp	16
Conversion of Salt-water into Fresh	16
Thames Tunnel	16, 111
Mr. Hancock's "Era"	16
Exportation of Machinery	16
Halley's Comet visible in America	31
M. Agassis	31
M. Arago	32, 144
Towing Boats	32
Surprising Swiftness of Insects	32
Macerone and Squire's Steam-carriage in Belgium	32
The late Mr. Symington and the Saturday Magazine	32
Bronze Sheathing	32
Parisian Char-volant	32
Cigar Nuisance	48
Obelisk of Luxor	48
Effects of Commercial Restrictions	48
Scotch India Muslins	48
Experiments on Human Strength	48
Iron Steam boat	48
Liverpool and Manchester Railway	48
Armed Steamers	48
Eelskin Water-proof Dress	48
Probable source of Errors in Charts	48
Cheap Almanacs	64
American Cotton Twist	96
New Theory of the Fall of Rome	96
Process of Pin-heading	96
Scott's Legacy to the City of Philadelphia	96
Factory Life at Manchester	96
Factories in Ireland	96
Mr. Telford's Legacies	111, 160
Railroad between Alexandria and Suez	111
Iron Steam-boat, John Randolph	111
Iron Ships sent to India	111
Drummond Light Improved	111
Cork Lighthouse	111
Cables of Aloe	111
New Application of Lithography	112
Principle of the Rocket	112
French and English Fires	112
Blind Man's Bible	112
Respectability at Dover	112
Infant Schools and Female Influence	112

PAGE

A Nobleman his own Architect 112
Celestial Phenomena 128
Steam Thrashing Machines 128
Hindoo Literature 128
Nutt's Bee System 128
Benefits of Steam Navigation 128
In-door Riding 128
Improved Microscopes 128
Sir Isaac Newton 144
Influence of Colour on Heat 144
Threshing Machines Worked by Hand 144
Oxy-hydrogen Night Telegraph 144
Miniature Steam-ship 144
Manual Labour and Mental Cultivation 144
Mrs. Somerville 160
Invention of the Compass 160
Colour of Chameleons 160
Birmingham Railway 160
London Mechanics' Institution 175
Russian Platina Mines 175
Origin of Mouldiness 175
Scottish Astronomer-Royal 175
Wreck of the Royal George 175
The British Association 175
To make Coffee like the French 175
Fattening Effect of Fogs 175
Award of the Sallande Medal to Prof. Airy .. 175
Antidote to the Plumbers' Cholic 175
Canadian Twin Steam-Boat 191
Iron Steam-Boat, Vulcan 191
Water-Tank at Dover 191
New Ball Projector 191
Late Celestial Phenomenon 192
Becher's Artificial Horizon 192
Fairy Circles 192
Sailing Railway Waggon 192
Calculating Machine 192
Tobacco grown in Russia 192
Royal Society Medals 192
Bread from Wood 192
Great Tom of Lincoln Redivivus 208
More Fiery Meteors in America 208
Cunningham's Shifting Paddle-Wheel 208
The Gulph Stream 208
Floating-Bridge at Gosport 208
Kyan's Dry Rot Remedy, as old as 1705 208
Russell's Steam-Carriages 224
Fusion of Iron 224
Steam-Boiler Incrustations 224
Dublin and Kingstown Railway 224
Bramble Wine 224
Prevention from Rust 224
Imitation of Gold 224
Days of the Creation 224
Perpetual Motion—at last! 224
Accident to Burden's Steam-Boiler 224
Collier's New Steam-Boiler 248
Railway Accident 248
Canal Swift Passage Boats 248
Algerine Cement 248
Steam-Waggon 248
Railroad Meeting in America 248
The Sea-Serpent again 248
Sir Felix Booth's Baronetcy 256
City Improvements 256
Exportation of Ice to India 256
Steam Explosion 256
The Cap of Liberty 256
Why the Sky appears Blue 271
Rising of the Sea in the Straits of Dover 271
The Red Tape School 271
Air v. Water 271
American Railway Performance 271
Birmingham Town-hall 271, 368
Fishmonger's-hall 271
American Act for the Prevention of Steam-Boat Explosions 271
Beer-drinking Britons 271
The Short Passage to India effected 271
Iron Castings 271
Southwark Literary Society 271

PAGE

Dublin and Kingstown Railway 271
Eastern Counties Railway 271
Papier Mâché Ornaments 287
Steam-Boat Mortality in America 287
Strength of Columns 287
Hancock's Steam-Carriage in Dublin 287
Manufacture of Shagreen 287
Floating Fire-engines 287
Competition Plans 287
Gypsy Colony in Louisiana 288
New Muzzle for Dogs 288
Mr. Cort's Railway Calumnies 288
An Honest Patentee 288
Old Weather Rule 288
Mr. Bulwer and the Southwark Literary Soc. 288
Liverpool and Manchester Railway 320
Giant Cliffs of Fossil Shells 320
Spontaneous Combustion 320
The Cynometer 320
Progress of Knowledge 320
Dr. Church's Steam-Carriage 320
Steam Expedition to the Euphrates 320
Death of Mr. M. Salmon 336
Canal Navigation Experiment 367
Improvement in Railway-Carriage Wheels .. 367
Great Rise of a Fish-pond 367
Useful Hints to Gas-consumers 367
Philosophical Pedlar 367
Steam-Carriage Company of Scotland v. Paisley Road Trustees 368
Cement Secrets 368
Fall of a Suspension Bridge 368
New Claimant to the invention of the Steam-engine 368
Manual Labour Academy 368
Magnificent Railway Viaduct 368
Portable Railway 384
Sugar, Wine, &c., from Potatoes 384
Green Colouring for Walls of Rooms 384
Concrete Foundations 384
The Laughing Gas 384
Patent Practice 384
Mr. Cort 384
The Winter in America 416
Receipt for Cleaning Glass 416
Railway Converts 416
Gas-lighting in France. Query. 419
Benefits of Inland Navigation 431
Driving Vessels under the Waves by Steam .. 431
New Zealand Flax 432
The St. Helena Inclined Plane 432
Total Eclipse of the Sun 432
Progress of Gas-lighting 432
Howard's Vapour-Engine 432
Curtis's Wire-gauze Spectacles 432
Lord Brougham and the Origin of Mechanics' Institutions 432
Professor Airy 447
Brother Jonathan 447
Miss Herschell and Mrs. Somerville 447
Fulton's First Steam-Boat Model 448
Steam v. Ice 448
The Ship Sinking System 448
Preparation of Hemp 448
Swiftness of Storms and Hurricanes 448
Patent Practice 448
Greenwich Railway 463
Adelaide-street Gallery 463
Electro-Magnetic Perpetual Motion 463
Caoutchouc Solvent 463
The Sun's Rays 463
City Improvements 463
British Enterprise 464
The Rival Cattle-markets 464
Solid Matter carried by Rivers into the Sea .. 464
The Short Passage to India 464
Zoological Gardens 464
The First Steam-Press 464
Chinese Mode of Printing 464
London Mechanics' Institution 480

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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

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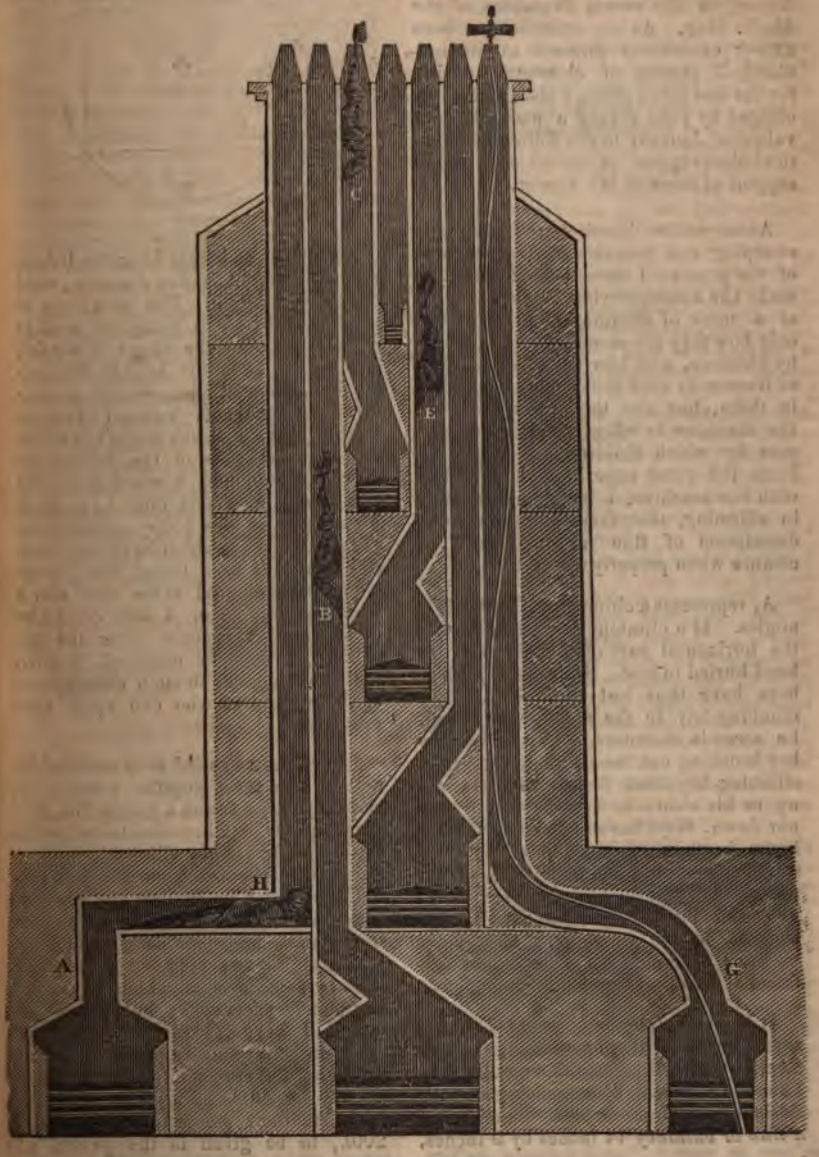
THE CONTRAST—MECHANICAL & CHILDREN CHIMNEY-SWEEPING.



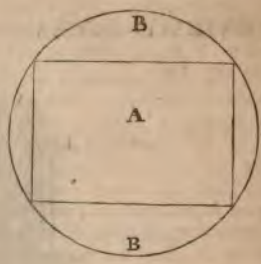
MECHANICAL CHIMNEY-SWEEPING—GLASS'S MACHINE.

Sir,—I have been much interested with the remarks made on children chimney-sweepers, by Mr. Archibald Rosser, in the recent Numbers of the Mech. Mag. As my attention has been almost exclusively directed to the mechanical process of chimney-sweeping for the last seven years, I shall feel much obliged by your giving a place in your valuable Journal to the following practical observations, in unison with and in support of those of Mr. Rosser.

As no written description of chimney-sweeping can convey an adequate idea of the process, I have been induced to make the accompanying sectional sketch of a stack of chimneys; showing, not only how they are ascended and cleansed by children, and how the poor creatures so frequently stick fast and get smothered in them, but also the perfect fitness of the machine to effect nearly every purpose for which children are employed. From the great experience I have had with the machine, I have no hesitation in affirming, that there is scarcely any description of flue which it will not cleanse when properly applied.

A, represents a chimney with two right angles. H a climbing-boy stuck fast in the horizontal part of a flue, with his head buried in soot. Scores of climbing-boys have thus lost their lives. B a climbing-boy in the attitude in which he ascends chimneys. C a climbing-boy brushing out the chimney-pot. E a climbing-boy stuck fast, with his knees up to his chin—he can neither get up nor down. Boys have been stuck fast for hours in this way, and have notwithstanding survived, as their position did not affect their breathing. G a chimney with the angles rounded off, and adapted to the machine. Chimneys, such as A, could be altered into this form, at a trifling expense.

It has been frequently asserted that a round brush will not sweep a square flue, but the fallacy of this assertion will be made apparent, by comparing a brush 18 inches in diameter with the orifice of a flue or chimney 14 inches by 9 inches, as in the following diagram, in which A represents the flue, and B B the brush.



A brush of 18 inches diameter, if thrust into a flue of 14 inches diameter, would completely fill it. The whalebone of which the brush is composed would be compressed into the shape of the flue, and so far from the angles being untouched, the whalebone would, as a natural consequence, expand into the angles. As the brush is worked up and down as the rods of the machine are added or detached, it must follow that every particle of dirt must be swept off. As a proof of this I may mention, that at repeated trials which have been made, it has always been found that the machine has procured more soot after a climbing boy, than a boy could after great exertion procure after the machine. It is to be observed, however, that the machines in such cases must be used by persons who can apply them properly.

I have been applied to to sweep chimneys of the most angular construction, and I have not found a single flue, however angular, or wherever situated, which could not by some trifling alteration be adapted to the machine without injury to the building, or causing any unsightly appearance. I might enter largely into the plan I adopt for coring chimneys, and also for sweeping long horizontal flues by machinery, in which I have been completely successful; but I am convinced I have intruded too much already on your valuable pages. I cannot, however, forbear mentioning, that the Society for Superseding Climbing Boys have in their possession a reward of 200*l.*, to be given to the person who

shall invent the best machine for sweeping chimneys. My machine has been considered the best for the last seven years, and I cannot tell how soon I may be called on to receive the above ample reward.* I should wish, therefore, that persons who have made a machine for this purpose would at once bring it forward, when, if evident proof can be given of its superiority, they will assuredly bear away the prize. I am informed there are two gentlemen, one residing in Jewin-crescent, and the other in Arundel-street, Strand, who have made machines of this kind far more effective than mine; but they consider, as I am an honest good-hearted fellow, they will not bring them forward to bear away the prize already within my grasp; but I can assure those worthy gentlemen, and all others who may entertain kindly intentions towards me, that I cannot decide in my own mind which would afford me the greatest pleasure, the possession of the reward in question, or the conviction that a machine was invented superior to mine, and better adapted for the purpose. For in the latter case I should soon escape from soot and sooty scenes, to resume again the plumb-rule, the level, and the square, which would be far more congenial to my mind.

I am, Sir,
Your obedient servant,
JOSEPH GLASS.

2, Moor-lane, Cripplegate,
Sept. 22, 1834.

CHILDREN CHIMNEY-SWEEPERS — FIFTH LETTER.

Sir,—I propose to turn over the leaves of the evidence and note down some striking peculiarities of torture and of suffering, and then dismiss this painful division of the subject we are upon. The witnesses will speak for themselves; they had all been climbing boys, and were, at the time of giving their evidence, master chimney-sweepers using the machine.

"I was taught to climb by journeymen following me up the chimney, beating my legs with a brush until I got to the top, then going from underneath me, whilst I was at the top, and leaving me to fall down three parts of the way, putting his brush across to prevent my falling on the grate."—"They stick a corking pin in the top of their caps, that we might not tread upon their heads when they go up to place our legs; and, if we slip down, to prevent our treading on their heads."—

"When the master's work is performed in the morning, if the journeyman can get any employment for the boys, he is permitted to do so for his own emolument?" "Yes; and that is a great hardship to a child. I have known a boy to climb from twenty to thirty chimneys for his master in the morning; he has then been sent out instantly with the journeyman, who has kept him out till three or four o'clock, till he has accumulated from six to eight bushels of soot."—

"Do you ever stick in the chimney?" "Yes, very often; I have stuck in one nine hours myself, in Bethnal-green; I was cut out by a bricklayer." "Were you near being suffocated?" "I was all but dead: I kept my bed a month—the bed I lay on, on the sacks."—

"Would not pads prevent the knees and elbows becoming sore?" "But a trifle; when you get into a small chimney you have not room to work as if you had them off, and there is a complaint or a hit with the brush as soon as the boy comes down."—

"Have you a brother an apprentice?" "Yes, three." "How long has the youngest been apprenticed?" "Just before Christmas; I do not think he is above eight years old, or hardly that." "Has he suffered much?" "Yes, he has suffered much with sore knees; he never had a pad on them; he has cried for hours and hours; and the other has got a parcel of hang-nails with climbing. They never were washed and taken care of; and he has a shocking bad swelling on his knee come up, and a great hole in it; and his master, if I had not taken him away from the dust-hole and took him to a surgeon, would not have attended to him."—

"Were you ever forced up chimneys against your will?" "I have been tried at that many times, but I would not suffer them to go on quite so far with me, for I would not do it; I have been beaten many times because I would not do it, but not at the house where it might happen; that was generally done at home in a private kind of way; they never would take that advantage of us at the house, in case persons there might take notice of it, but it was done quietly at home out of sight."—

"Did any accident ever happen to another boy to your knowledge?" "Yes, to Joseph Simpson, a boy who came to us in petticoats, and we breeched him." "How old was he

* A full description of Mr. Glass's machine will be found in our Journal of April 12, 1828, No. 243.

at the time?" "His father said he was seven years old; his father had run away at the time the accident occurred to him." "What was the accident?" "He fell down the chimney of the new hall at the Blue Coat School, and broke one of his legs." "Did the accident hurt his eyes?" "It cut his eyelid down here, and he went blind; but he went to the hospital, and I believe his eye-sight was restored; but he has always an opening there."—

"The chimney had been burning about four or five hours, and I was completely forced through it; I burnt my knees, and burnt the shirt I had on. I was obliged to be pulled through the chimney at last with a rope; I was pulled through the top by my fellow-apprentice." "How old were you at that time?" "About nine years old."

I think it unnecessary to transcribe more of the evidence in reference to suffering; but I will, in conclusion on this topic, give an extract from a pamphlet written by a builder, who had been a climbing boy and afterwards a master chimney-sweeper. This person was, strange to say, examined in opposition to the bill. He was examined at great length, and appears to have been a most willing witness on the side of the party by whom he was called. He was asked —"Do you consider that when a boy is apprenticed to a respectable master chimney-sweeper, his condition is inferior to that of many other trades in the metropolis?" and he answered, "Not at all; as happy as any of them." Towards the close of his examination, however, the following passage was put into his hands, and he admitted that he was the author of it:—

"Though climbing chimneys may not be an ancient discovery, it is not so modern that we can trace its original; but, from its nature, it was probably the desperate expedient of a criminal, or the last resource of some poor negro, to prolong a miserable life. I know, from experience, that no employment is more laborious than climbing chimneys. From what I have stated, the chimney-sweeper's misery, during his apprenticeship, is evident; nor does it find a period here, for the conclusion of one scene of wretchedness is with him the beginning of another, if possible, more deplorable, but less pitied: in his childhood he might suffer from the nature of his business and the inhumanity of his master, yet at that time every hand was ready to relieve his wants; but, arrived at maturity, he no longer appears the friendless orphan, or the child of sorrow; he has learned a trade he can no longer work at; nature's bounty, a blessing to all other young people (as it fits them for their different employment, by giving bulk and strength to the animal frame), is to him, in respect to his trade, of but little advantage; none but small boys can sweep chimneys in London, or any other large places in England. He is sixteen years of age, and thrown upon his own hands and the public; he has no friends who can help him on in the world, or they would probably have disposed of him differently; weak and stinted in his growth by his profession, he is incapable of any employment which requires strength; he is, upon the whole, too old and too large to sweep chimneys, and too young and too little for any thing but a second apprenticeship."

This was the deliberate, written, and published statement of one who had passed through all the stages of the chimney-sweeping trade.

The advance made towards the remedy of the various evils, detailed in this and the foregoing letters, was less than the advocates of the Bill struggled for. The Act imposes a penalty, not exceeding 10*l.*, nor less than 40*s.*, on the offence of employing in the trade of a chimney-sweeper, any child under the age of fourteen years not being an apprentice bound under the provisions of the Act. Other sections forbid the taking as an apprentice of any child under the age of ten. The promoters of the Bill strove hard, for obvious reasons, to prevent apprenticing being allowed under the age of fourteen. As, however, if they had persisted, a debate in the House of Lords would have arisen; and as, at the very late period of the session at which the Act passed, there was every probability that a debate would prove altogether fatal to the Bill, noble lords thought best not to persist. But, though not satisfactory in every respect, the Act is very beneficial. Chimney-sweepers taking apprentices must be householders, paying rates and taxes. The apprentice under fourteen must wear a brass plate denoting certain particulars of dates and names, intended to prevent the fraudulent apprenticing of children under ten. No person is to be sent up a chimney on fire. The binding of the apprentice is to take place before two justices of the peace, and with certain forms, which were intended to prevent

fraud and coercion. Apprentices are not to be let out to others. Children may have trial, under sanction of the justices, of the business before apprenticeship, and they are to be examined by the justices after the trial. No master is to have at one time more than two boys on trial, and four apprentices. Various provisions are made for the prevention of ill-treatment, or for punishment in case of its taking place. Chimneys hereafter to be built or altered are to be constructed so as to admit of their being swept by machinery, under a penalty of 100*l. on the master builder or other master workman*, recoverable by action. Lastly, a schedule, appended to the Act, provides the form of the indenture of apprenticeship, by which the master covenants, among other things, to allow the apprentice "competent and sufficient meat, drink, washing, lodging, apparel, and all other things necessary;" not to assign without the consent of two justices; to provide the apprentice a proper climbing dress, and yearly one whole and complete suit of clothing, with suitable linen, stockings, cap or hat, and shoes; once a week, at least, to cause the apprentice to be thoroughly washed and cleansed from soot and dirt; to require the apprentice to attend the public worship of God on the sabbath-day, and permit him to receive the benefit of any other religious or useful instruction, and that the apprentice shall not wear his sweeping dress on that day; not to permit the apprentice to call the streets; not to compel the apprentice to exercise his business between the hours of eight at night and four in the morning from the 1st of November to the 1st of March, inclusive; not to require the apprentice to go up any chimney on fire; not to make use of any violent or improper means to force him to climb any chimney; in all things to treat him with care and humanity.

But, after all, the only effectual remedy for all the mischiefs we have been to painfully engaged on, will be the general adoption of the machine, *to be used honestly and fairly by persons not employing climbing-boys.*

We have now gone through some of the prominent evils and miseries attendant upon the employing of children for cleansing chimneys. We have seen that the use of the human body within the chimney for such a purpose is a wretched expedient, utterly unworthy of the age in which we live; that the master chimney-sweepers are opposed to any better expedient; that the child is not to be relied on even for the purpose of cleansing; that a great proportion of the chimney-sweeping trade constitutes a nursery for thieves; that the occupation has a tendency to produce disease (and I might have said much about blear eyes, stinted growth, distorted limbs, and pulmonary and rheumatic affections); that already does a great portion of the well informed part of the community prefer the inanimate machine; that for detecting and repairing dangerous defects in chimneys, climbing boys are not at all to be depended upon; that, if to detect and repair such defects by ascending the interior of chimney is practicable, a brigade of small persons, not children, for the service of the town—persons who would be accustomed to such operations—would be easily raised, and would be greatly preferable for such purposes to the common run of climbing children; that much low cunning is put in action by the master chimney-sweepers to prevent the adoption of machinery; that children of very tender age, and even female children, have been employed in the painful occupation of cleansing; that great cruelties have attended the employment of children chimney-sweepers, some wantonly inflicted, but most of them (which makes much in favour of my argument against the use of any thing but machinery) inflicted through brutal ignorance; and that the legislature has not yet provided a full and efficient remedy for all these crying evils.

Where, then, are we to look for the remedy? To the public—to the body of housekeepers, who, if they are deaf to the calls of humanity, ought at least to think of their own interests. More than half the burnings of houses which take place, arise from defects in chimneys, or from chimneys being only partially cleansed. The worst work in the building of a house is generally, I find, that executed about its chimneys; and I declare, since I have had this subject under consideration, I feel no small increase of anxiety on the score of the danger to life and property from fire.

In this state of things are we to remain content to use a most powerful and destructive agent in the very hearts of our dwellings? I speak to the cool understandings of the heads of families. I hope I have not availed myself unduly of the materials before me for appealing to their passions. I might have dilated and expatiated on the sufferings of the poor children more than I have done. I might have called on fathers and on mothers to place, in imagination, their own beloved offspring in the state of the unfortunate offcasts with whom the chimney-sweeping trade is supplied. I have aimed not at exciting feelings, but at influencing reason and common sense.

In circulating the observations I have thought it proper to make, I have availed myself of *your* kindness, because your periodical being devoted to the cause of science and the arts, I hoped—let me trust, not in vain—that, besides demonstrating to a considerable number of persons, the importance of a subject which has, I regret to say, been treated by some as one but trivial, I should stimulate ingenious men to the invention of still more easy means than have yet been published of cleansing and repairing chimneys. There is, if I do not mistake, in the hands of the society for superseding the use of climbing boys, a fund of no inconsiderable amount, which is to be given to the inventor of the best machine for cleansing chimneys. I shall make inquiry about this fund, and furnish you with such particulars as may be called for relative to its creation and destination.

Having but little mechanical knowledge myself, I do not presume to suggest any thing in the way of improvement in the machinery required. For cleansing, Glass's, the machine now commonly used, seems to be fit for its purpose. With regard to defects in chimneys, I have questioned several chimney-sweepers, and I find that if some platform, or other support, were afforded to the person employed, so that he would not have to keep himself up in the chimney, he could explore its interior with great minuteness, and, although not easily, could in very many cases sufficiently repair defects. The inconvenient draft up or down the chimney must be got rid of, and some contrivance must be devised by which he would be supplied with a steady strong light. Why does not Mr. Braidwood, to whom we are so much indebted for his attention to the subject of casualties by fire in houses, give his able aid on this head? Surely he might organise a brigade of chimney-examiners and menders, and furnish them, as to their office, with "all appliances and means to boot." I can imagine within the chimney, though I cannot invent the details, a dexterous man of small dimensions, either elevated by machinery, or let down from above, furnished with a good light fixed on his shoulder, a belt round his body, supplied with appropriate instruments, and the draft shut out from above or from below, working away with perfect coolness and composure, and with some ease. A person so accoutred, and with experience, could either mend from within, or point out with certainty what would require amendment from without. However, here I am, perhaps, getting out of my province.

As I am not aware that I have any thing to add to these letters as a series, it only remains for me to thank you, which I do very cordially, for permitting me to detail facts, and to express my opinions on this to me interesting topic, through the means of your Numbers.

With respect to the reward I have alluded to for a machine, and some small matters which I may have forgotten, or which have not entered into my plan, I may ask for your further indulgence.

I am, Sir,
Your obedient servant,
ARCHIBALD ROSSER.

15, New Boswell-court,
October 1, 1834.

THE ENGLISH WHITE SLAVERY.

Sir,—I, in common with many other persons possessed of a touch of humanity, have been well pleased with a new feature in your Magazine—the continuous advocacy of the cause of the oppressed "climbing boys," by Mr. Rosser. The hearts of all the humane are with him, in his persevering efforts, which do him so much honour, and which cannot fail of a successful result in the long run. It was a harder task to accomplish the destruction of African slavery, and in the

outset a perilous undertaking; yet the time is now made certain when English legislation will be freed from the odious task of recognising such a being as a legal slave. Our natural negroes will be freed, and so also will our artificial negroes in due time.

If it be alleged, that the prohibition to use small live human bodies as chimney brooms would be an interference with vested interests, and destructive of most existing chimney property, it may or may not become a question of compensation, as in the case of the prohibition of negro slaves. The "property men," who make laws for us, will, doubtless, make a strong stand in favour of their own interests, and have as good a bargain as they can out of any change that may take place. But all this is of no consequence. The straightforward course is not to offer premiums for sweeping machines, or jointed brushes, or to ask master chimney-sweepers' opinions as to their practicability, but to pass a law, to be in force three months after its date, making it felony for any adult to employ any minor, or to suffer any minor in his or her charge, to enter a chimney or flue, either for the purpose of sweeping or any other purpose whatsoever. When the traffic in human bodies was only smuggling, punishable by fine, it continued to exist; when it was made felony it ceased to exist.

The house proprietors may allege that their houses were built upon the understanding that tender aged human beings would be allowed to sweep the chimneys, and that therefore the property actually existing must be held sacred. The simple answer to this is, that human beings existed before artificial property existed, and therefore they have a prior claim to protection. To deny this, would be to assert that men were made for the uses of things, and not things for men's uses. And, even setting the question of humanity aside, and reasoning on the politico-economical tendency, it is shallow policy in a state to suffer any branch of labour to be performed by children, which has a tendency to unfit those children for other employments when grown up.

It is of no use multiplying words; while the laws permit young children to be burnt alive, or suffocated with soot, children will be found to supply the demand, and the construction of chimneys will remain unaltered. When it shall be made felony to risk the roasting of a young child alive in a brick-work tube, the good easy people, who maintain kitchens, and parlours, and drawing-rooms, and bed-rooms, will bestir themselves to make the needful alterations to ensure themselves the comforts of good dinners and well warmed apartments, and all the world will wonder at finding it so simple a matter,

The principal reason why machines are disliked by the master-sweeps would seem to be, the difficulty of adapting them to irregular shaped chimneys, and, moreover, the rough surface they have to encounter. But in case of a general alteration, would there be any difficulty in building into the walls flat cast iron pipes, jointed after the manner of the outside water-spouts, of some such proportion as six inches by twelve, and parallel from end to end? Would not such pipes actually strengthen a wall, and might not rooms be built upon that plan, without the usual unsightly encumbrances denominated chimney piers? Might not space be thus advantageously gained? It is evident that such a chimney might be swept by means of a plunger-board attached to a rope, nearly as easily as a gun-barrel is cleaned by a wiping rod.

With regard to the people who use such arguments as Lord Lauderdale, *i. e.* ridicule, for the destruction of humanity to climbing-boys—I could wish them to undergo some such trial as Byron proposed for Izaak Walton:—

> "The quaint old cruel coxcomb, in his gullet
> Should have a hook, and a small trout to pull it."

If there be amongst our legislators, men who will argue that boys should serve for chimney-brushes, they should forthwith be sent to the Weald of Kent to sweep a score of small-sized chimneys each, in the winter time, with the snow on the ground, without their breakfasts beforehand, and with but an uncertain chance of getting them afterwards. I do not like cruelty for the sake of cruelty, even to such wholesale mischief-makers as many of our law makers are; but when men's faculties are so obtuse that they cannot comprehend mentally the pain they inflict on others, it becomes abso-

lutely necessary that the iron which cannot "enter their souls" should be applied to search out their nerves, if nerves they happen to possess. It is an insult to the human understanding, to be told that it is a fitting thing to destroy morally and physically an annual number of human beings, for the purpose of ministering to a simple convenience of the remainder, even supposing there were no other means of procuring that convenience, which is not the case.

The salvation of the "climbing boys" was of yore one of the hobbys on which the politicians, known, when in office, under the name of the "broad-bottoms," delighted to ride, after they were excluded from office. They are now once more in office, and the question is not one of policy, but of wisdom and humanity, which are both outraged by its remaining a question.

I remain, Sir,

Yours very truly,

JUNIUS REDIVIVUS.

Sept. 30, 1834.

P. S.—I have no leisure, at present, to refer to the exact words in my former writings, from which a "Looker-on," of Bridgewater, would argue a discrepancy of opinion; but I am perfectly sure that if he reads all the context he can come to no such conclusion—errors of press, such as that of "impediment" for "improvement," in his own notice, being of course allowed for. The question at issue is, *Ought the mental or physical condition of the people to be first improved?*

I answer unhesitatingly the physical, and for this simple reason—so long as a human being is conscious of physical pain, arising from unsatisfied natural wants, he cannot efficiently use the mind which his body may contain, and therefore is not in a fit state for mental training. Now surely none of the strong arguers for physical supplies, not even Mr. Cobbett himself, will contend that the whole English nation, or even more than a small portion of them, are actually destitute of bacon and bread, or some other substance, wherewith to appease the pangs of hunger. It must be clear, therefore, that in this small portion only are the unteachable ones to be found. But though these cannot be taught till their bodily wants are provided for, there are abundance of those whose bodily wants are well supplied who yet lack mental training, and to whom mental training might be advantageously given; and if they had efficient mental training they would immediately operate upon their poorer brethren, by all the available means wherewith mind commonly rules matter, in pointing out to them the methods of avoiding poverty by voluntary exertion and abstinence combined, and in restraining them by social regulations from multiplying misery to the injury of themselves and their neighbours also. The passenger who has only paid for his own passage in the vessel is not entitled to bring his relations with him to feed on the common stock, until he has added the necessary proportion of provisions. All that I contend for is, that till those who are physically well off are sufficiently provided with mental training, it is comparatively of little use to attempt to improve the physical condition of the starvers. It is like the Danaides continuing to fill their pitchers with holes in the bottoms. It had been better for them to have provided "good and sufficient" corks, ere they commenced their labours. Those who are in a starving condition are necessarily maintained by charity. In a well-regulated nation there would be no need of charity. A provision of mental skill and forethought would place each human being who possessed it in a situation to provide for his own physical wants instead of depending upon others. The aim of true benevolence should be to prevent wants, not to provide for them.

Is a "Looker-on" yet convinced that it is possible for mental and physical improvement to advance side by side, amidst the various-conditioned people of England, giving to one a book, and to another a loaf—or rather the means of earning it? I thank him for his notice, for two reasons—first, that it enables me to correct a mistake into which others besides himself may have fallen; and, secondly, it is a cheering thing to a writer, whose only aim is the welfare of his fellows, to find that one who lives in a distant spot feels a kindly communion with his mind through the agency of printed types.

COURBE'S THEORY OF THE BRAIN.

Sir,—The following paragraph, containing a most extraordinary hypothesis relative to human brains, has been going the round of the periodicals; its insertion in your Magazine, with a few remarks tending to induce a closer examination of the theory may be productive of considerable advantage:—

"M. Courbe, who has been engaged some time in a chemical and physiological examination of the brain has ascertained the singular and interesting fact, that its composition varies in a remarkable degree, according to its different states of health or disease. The element, which occurs in different quantities, is phosphorus, of which he reports that the brain, in its normal state, contains 2 to 2½ per cent.; while the brains of idiots contain but 1 to 1½, and those of a madman, 3, 4, or even 4½. 'Thus,' says M. Courbe, in conclusion, 'it would follow that the absence of phosphorus from the brain would reduce man to the sad state of a brute; that the great excess of this substance would irritate the nervous system, exalt the individual, and drive him into that furious excitement which we call madness or mental alienation; and, finally, that a mean proportion re-establishes the equilibrium, gives birth to the most sublime thoughts, and produces that admirable harmony, which, in fact, is the soul of the spiritualists.'

"From all this it clearly follows, 'that the soul, that very fiery particle,' is nothing more or less than a couple of grains of phosphorus!

"M. Courbe's memoir has been read before the Academie des Sciences, and is to be published in the following numbers of the 'Annales de Chemie;' we recommend it to all who wish to learn the meaning of the poet's expression:—'*Cum actione insanire.*'"—*Athenæum.*

Curious as this hypothesis may at first appear, a little consideration and reflection will be sufficient to show its fallacy. M. Courbe brings forward the singular and interesting (novel?) fact, that the chemical composition of the brain varies in a remarkable degree, according to its different states of health or disease, and that phosphorus is the element which occurs in different quantities; but, I would ask, is it *the only element* that is found subject to such changes in quantity? M. Courbe next informs us, that the decrease or increase of this element (phosphorus) will cause idiotcy or madness; for, says he, "the absence of phosphorus from the brain would reduce man to the sad state of a brute." Here a question naturally arises, is it true, as is inferred, that the brains of brutes contain *no phosphorus?* This is a startling proposition, and not to be received on slender grounds. M. Courbe goes on to say, that the excess of phosphorus would irritate the nervous system, and induce madness; but it appears to me that, in this burlesque upon mind and matter, cause and effect are made to change places, and that if the quantity of phosphorus in the brain varies as stated, it would be more rational to attribute such an effect to the nervous excitement into which this organ is thrown—knowing, as we do, the changes effected by disease on the other component parts of our bodies.

Admitting for a moment M. Courbe's conclusion, that the soul is nothing more nor less than a couple of grains of phosphorus, we should discover another equally singular and interesting fact, viz. that the soul is not situated in the brain, but in the skull itself; or, rather, that it is dispersed throughout the bony structure of our systems—as bone, at all times, contains much more phosphorus than brains, or any other animal substance. It would then also appear, that part of the soul is daily thrown off in the excretory processes of nature—instance the mode in which chemists at first obtained phosphorus.

Although it is evident that disease constantly effects great changes in the chemical composition of the human body, in the bones, blood, &c., certain it is, that M. Courbe has not yet thrown much light on the subject by his *luminous* remarks, contained in the foregoing extract, which will only lead thinking persons to give him credit for a maximum share of phosphorus.

I am, Sir,
Yours respectfully,
WILLIAM BADDELEY.

London, Sept. 9, 1834.

Sir,—I agree with your correspondent P. P. C. R. in the greater part of what he says respecting the Duke of York's column; and, indeed, I have often felt what he describes the appearance of the statue to be, when houses interpose between it and the eye. The statue is also too heavy for the column, and Mr. Wyatt agreed with me that it ought not to have been more than 11 feet 6 inches (instead of 13 feet 9 inches), so as to suit the column, and to have the appearance of being the height of a man of his late Royal Highness's stature when viewed from the Park. The great beauty in the construction of the Duke of York's column is the mode adopted to get over the difficulty of building a substantial pillar of limited diameter, with a staircase inside of sufficient width; for had not the plan adopted (or some such other) been thought of, the diameter must have been increased, or the staircase narrowed, so as to make the outer walls or casing of sufficient thickness to stand. In building the Trajan's column, they were enabled to procure blocks of stone of such size, that each course was formed out of only *one* stone; but Mr. Wyatt assures me that the Duke of York's column is much stronger than its prototype—on the principle, that a ring of any material is stronger when composed of several pieces, strongly joined in different parts, than when formed of one uniform piece; and, therefore, his dove-tailed keys make the work more substantial, than if each course were cut out of only one stone. I can assure P. P. C. R., that no fear of offending any one withheld me from censuring the plain iron railing. That I did not do it, is simply because in my humble opinion an ornamental railing in such a situation would take away from the effect of the structure; for I never like to see any frittered work, especially of iron, placed in front of a structure, as I think it detracts from its appearance of solidity and architectural grandeur.

I remain, Sir, yours, &c.

R.

SPACE WHICH WOULD HOLD ALL THE GENERATIONS OF MEN THAT HAVE EXISTED SINCE THE CREATION OF THE WORLD.

Sir,—I was much amused at the extraordinary result of a calculation, by one of your correspondents in a late number, in which he shows that a circle of about three miles radius will hold all the present inhabitants of this world, taken at 900 millions. He allows 1 square foot to each, and we then have

$$\sqrt{\frac{900{,}000{,}000}{{,}7854}} = \frac{33851{,}3}{2} \text{ feet} = 3{,}2 \text{ miles.}$$

But as there are a few Daniel Lamberts, and as it would be rather unpolite to crowd the ladies, without saying a word about those who may bear ostensible proofs of having "loved their lords," perhaps we had better give each person a square yard; the radius of the circle is then 9,61 miles.

Pursuing the same train of ideas, what would be the number of persons assembled, were the day of judgment to take place in 1834, and what space would they require?

It is not possible to do more than approximate to these numbers; let us take, however, the best data we have, putting

the first term (2) of a geometrical progression $= a$
the last term (900 millions) . . . $= z$
the common ratio (2) . . . . $= r$
the term . . . . . $= s$
the No. of terms . . . . . $= n$

Taking the Hebrew text, we have

$$4000 + 1834 - 1656 = 4178 \text{ years since the flood;}$$

then $n = \dfrac{\text{Log.} \dfrac{zz}{a}}{\text{Log. } r}$ and as $r = a$, this becomes $\dfrac{\text{Log. } z}{\text{Log. } r} = 29{,}745351,$

which requires the population, since the flood, to have doubled every 140 years from 2 progenitors.

Up to the flood we have $\frac{1656}{140} = 11{,}8$ terms, if the same law held—say 12.

We then have for the sum up to the flood,

$$s = \frac{r^n - 1}{r - 1} \cdot a = \frac{r^{12} - 1}{1} \cdot 2 = 8190;$$

of which were alive $ar^{n-1} = 2 \cdot 2^{11} = 4096$.

Since the flood we have

$$s = \frac{2^{30} - 1}{1} \cdot 2 = 2174480000.$$

Let b = births, d = deaths, and a = the number living at any time; we then have, as they double in every 140 years, $b - d = \frac{a}{2}$ at a mean for each 140 years; whence $b = \frac{a + 2d}{2}$ and if $b : d = 4 : 3$, then $\frac{a + 2d}{2} : d = 4 : 3$; or, $3a + 6d = 8d$; or, $d = \frac{2a}{3}$, whence $b = \frac{a + 2d}{2} = 2a$.

Whence, as in each term which makes the series, at steps of 140 years, the births between that term and the preceding have been double the numbers then existing, on an average; the whole sum of the series of births is double, being

	4,294,960,000
add for before the flood	16,380
	4,294,976,380, or about 4 and a quarter thousand millions.

To find the space these will require, at 1 foot each, which we may now safely allow them, as we seldom hear of fat ghosts, we have

$$\sqrt{\frac{4294976380}{,7854}} = \sqrt{5468520983}$$

$= 73900$ feet nearly, and $\frac{73900}{2} = 36950$ feet, or 6,9981 miles; or, in other words, a circle of 7 miles radius would, in 1834 (leaving out an *if*), hold all that do exist and have existed since the formation of this world, according to the Hebrew text.

Your obedient servant,

λ.

REMARKS ON THE VARIOUS METHODS OF PROPELLING VESSELS BY PADDLE-WHEELS, PLUNGERS, OARS, &c.

Sir,—Having once spent some time and money, to very little purpose, in getting a small experimental steam-boat made, to try and do away with the back-water, and other disadvantages, attending the common paddle-wheel:—one of the plans I tried was vertical paddles, wrought with cranks, and so arranged as to dip into the water edgeways, perform their stroke, and then leave the water in the same manner. This looked very well in theory, but when applied to the boat they were altogether unsuccessful, and did not produce nearly the effect of a common paddle-wheel. I see the same thing patented by an American; I wish him joy of his invention.

Ever since this failure of mine, I have taken great interest in steam-boat improvements. I therefore read Mr. Aldersey and Mr. Forman's articles, in your last month's Number, and found *nothing new* in either of these gentlemen's plans; and as Mr. Forman calls for opinions on the subject, I shall feel obliged if you will give me room for the following remarks in your interesting work:—

In the first place, then, Mr. Forman's

objections to the paddle-wheel, in a rough sea, in action, and under canvass, are admitted on all hands; but, in my humble opinion, he has not shown us a good substitute for it. The speed, per minute, of Mr. Forman's "plungers," with an engine of a 2 feet stroke, applied as he points out, is equal to only *two miles per hour!* Does Captain Forman suppose his boat is to go quicker than his propellers? Surely; or he would not be satisfied with their speed. I see, from the whole arrangement of his apparatus, that he is not mechanic enough to know what speed is necessary for his "plungers;" I shall, therefore, suppose he has got them up to fifteen miles an hour, either by wheels or pinions, or by increasing the diameter of his "trunks" as much above the canals as will produce the required velocity; he will then find that the quantity of friction, in both cases, far exceeds the imperfection of the common paddle-wheel.

The following schemes, that I know of, have all been tried, and have not come up to the common wheel—namely, wheels with mechanism to dip the float-boards, edgeways, duck feet, spiral screws, sculling machines, *blowing air out of the stern*, forcing water out in the same way, and vertical or crank paddles. With such an engine as Mr. Forman proposes to employ, driving a wheel twelve feet diameter, the motion of its periphery would be *eighteen miles an hour*, instead of *two miles an hour* with the "plungers."

The superiority of the common paddle-wheel seems to consist in its continuous and rapid motion (always much exceeding the velocity of the vessel), and the ease with which the speed is brought up from the engine, without the aid of wheels or pinions; although its action is imperfect, none of the other methods can be driven up to a speed sufficiently above the sailing rate of the vessel, without greater friction (and consequent loss of power), than what is lost by the back-water and oblique descent of the common paddle-wheel.

Officers of the British navy would do well to study engineering a little, now that our mode of fighting will be altogether altered by steam-ships and tugs, and then, from their superior experience in nautical matters, they would be able to devise *improvements* in steam-vessels; at all events, they should understand something of the nature and properties of the fluid in which they swim, or they may commit some unpleasant blunders, such as ballasting ships by allowing the water to flow through "canals on each side of the kelson."

Your other correspondent, Mr. Aldersey, can see two twin-boats at the Dundee ferries nearly the same as he describes. He can take a trip in the Dundee, see the twins, and be in London again in four days. The only improvement I can see in Mr. Aldersey's plan is in the bows. The "Union" and "George the Fourth" are both formed of two things like common boats, and the water being forced between their bows, it rises eight or ten inches higher than the real water-line; of course this is power lost, and Mr. Aldersey's water-course being parallel from end to end would obviate this. The Dundee boats have engines more than double the power that would be necessary to drive single boats of the same size, and yet they are slow sailers.

Mr. Aldersey, I see, supposes his boat will sail as fast as the velocity of his wheel: if this were the case, what is to keep up the motion of his vessel? To produce 24 miles an hour, the wheel would have to make 60 revolutions instead of 45 per minute, to allow it to strike the water with sufficient force; and what an enormous engine (for such a boat) it would require to drive a wheel 16 feet diameter, 18 feet broad, and 2 feet immersed in the water, at 60 turns a minute! Mr. A. has prudently omitted to give us the power necessary to work a boat 24 miles an hour. I cannot see how this plan is to alter one of the laws of mechanics—"what we gain in velocity we lose in power." As Mr. A. proposes trying the plan on small boats, I may give him the result of my experience with paddles, versus oars. I have tried the experiment with two wheels, and oars, on a common boat, and found that a man could continue longer, and sail one-fourth quicker, with oars than with paddle-wheels. It must be evident that the oars have the advantage, as there is no back water, nor oblique descent, with them; the man's whole physical force is applied to the gunwale of the boat, as he works upon the short end

of a lever, and any slip the blade may make in the water is reduced in proportion to the length of the oar. I refer your readers to an able paper on this subject in the January number of the "Edinburgh Philosophical Journal" for 1820. I remain, Sir,

Your most obedient servant.

D. LANDALE.

Wemyss Cottage, Sept. 24, 1834.

THE NEWLY-DISCOVERED COMPOUNDS OF CARBON WITH HYDROGEN.

Sir,—The recent discoveries of Mr. Faraday, relating to the compounds of carbon with hydrogen, demand the particular attention of chemical philosophers. It was not until lately that more than two such compounds were distinctly known, viz. carburetted hydrogen and olefiant gas. Mr. Dalton afterwards pointed out a third, existing in the aeriform products of coal, but it has not yet been separately exhibited. Mr. Faraday has since discovered two new compounds, by subjecting oil gas to pressure, and distilling the fluid obtained. The first by analysis over ignited peroxide of copper was shown to be composed of 4 atoms of carbon and 4 of hydrogen, and the other (which he obtained from the same fluid by evaporation, and subsequent condensation) he inferred to be composed of 6 atoms of carbon and 3 of hydrogen. The following table will show the peculiar atomic constitution of each of the compounds:—

	CAR.		HYDG.
Carburetted hydrogen	1	+	2
Olefiant gas	2	+	2
Super olefiant	3	+	3
New gas	4	+	4
Bicarb. hydrogen . . .	6	+	3

The inference we should draw from the consideration of this table is, that there are other compounds of hydrogen and carbon existing, a compound of 1 carbon and 1 hydrogen for instance.

It is, however, on the subject of the chlorides of carbon, likewise discovered by Mr. Faraday, that I wish principally to address you. It is a very interesting experiment to form the substance called chloric ether, by mixing equal quantities of olefiant gas and chlorine; but when these two gases are mixed in the proportion of 1 of the former to 8 or 9 of the latter, the result is still more interesting. The first time I tried this experiment, after allowing the gases to remain together a day or two, perceiving no change, the colour of the chlorine appearing as yellow as at first, I supposed that I had mistaken the proportions, and took no notice of the bottle for a week or two, at the end of which time, taking the bottle for some other purpose, I was surprised at perceiving the inside almost entirely covered with small transparent crystals, while the colour of the chlorine was almost gone —these were the perchloride of carbon. I removed them from the bottle with a feather. The smell was very similar to camphor. It was not readily combustible, but when held in the flame of a lamp it burnt red, and threw off free carbon. In short, as far as I could judge, it was identical with the perchloride described by Mr. Faraday. The circumstance of this experiment show how necessary it is for the chemist to keep all the results of his various mixtures as long as possible—it is thus that new facts are brought to light. If you think these remarks worthy of a place in your useful publication, they are at your service, and shall be hereafter continued.

I am, Sir,

Your obedient servant,

ω.

Bath.

RECENT AMERICAN PATENTS.

(Selected from the Franklin Journal.)

CLOTH DRESSING MACHINE — *S. R. Packhurst, Massachusetts.*—The claim made made in this machine is to the combination of the several parts described in the specification, by which, among other advantages, will be that of the saving much of the labour and expense which are encountered in the process usually followed. We are informed that when it is used, "the cloth may be taken from the fulling, or rinsing mill, and stretched, made smooth for napping, napped, steamed, and dried ready for shearing, by simply passing it through the machine, thereby saving its being passed through several hands, and operations, to accomplish the same purpose." There are to be six principal rollers mounted in a frame, and moved by proper gearing; two of them,

called the winding rollers, are to receive the piece, so that it may be alternately wound from one to the other; in doing which it is passed through two pair of rollers, which are pressed together by suitable means. Above the cloth, and between the pairs of main rollers, are placed two napping cylinders, covered with card teeth, or teazles; these do not touch the cloth, excepting when it is borne up against them by an apparatus acting upon it for that purpose. There is attached to the machine a stove, or heating apparatus, the main flue, or body, of which is placed below the cloth, in such a manner that the water which is squeezed out of it by the rollers shall fall upon the surface of said stove, and be thus converted into steam; which, it is said, will, in most cases, be sufficient for the steaming of the cloth. It will be seen, by those acquainted with the dressing of cloth, that there is nothing new in the principles involved in the application of this machine, and the claim is, therefore, very properly confined to the particular combination and arrangement of its various parts, so that the whole, or any required number of the operations, may be simultaneously performed.

PROPELLING BOATS ON CANALS — *Charles Bonnycastle, University, Albemarle County, Virginia.*—A rail, resembling Palmer's single rail for railroads, is to be constructed along the middle of the canal; it may be even with, or elevated to any convenient height above, the surface of the water. This rail is to be surmounted by one of iron, which is to be acted upon by the power employed to propel boats. These boats are intended to be long and narrow, as they are to go two abreast, one on each side of the rail; a train of them is to be connected together, the two foremost of them carrying the steam-engine, or other motor. Two wheels, which may be of the size usually employed upon railroads, are made to revolve horizontally against the opposite sides of the rail, embracing it between them, they, by a suitable contrivance, being made to press against it, so that by their friction the locomotion may be effected.

The boats on the opposite sides of the rail, are to be connected together by suitable straps which pass over it, and their stems and sterns are so constructed and adapted to each other, that whilst they are allowed to have play enough to turn round curves, they may operate as nearly as possible, like one continuous boat.

The advantages anticipated from the foregoing construction are the following:—

1st. The application of steam, or other power, for propelling boats upon canals, or other waters, where it is not now employed, because the action of paddle wheels would be destructive to the banks.

2d. The keeping in a certain line, by means of the rail, admitting of a great increase in the length of the chain, or train, of boats; their width and depth being diminished in proportion, whereby the resistance, and the consequent washing of the canal, are greatly decreased.

3d. The using of short boats, whereby a long chain of them will be enabled to turn on such curves as are common on canals; and also to allow them to pass over inclined planes.

In passing over inclined planes, wheels, with trucks, such as are now employed, or others which may be found convenient, are to be used, locomotive or fixed engines being employed. The claim is in the following words:—

"What I claim as my invention, is the use of one or more railways elevated above the surfaces of canals, rivers, lakes, or other waters, or placed at small distances below those surfaces; the word surface herein designating the surface of the water. Also the use of such method of connecting boats as that herein described. And also the use of a motor, having wheels clasping a rail, and detached from the locomotive engine. And I do especially claim to myself the right of using this motion for propelling boats, barges, or other vessels, along canals, rivers, lakes, or other waters. I claim, and do reserve to myself, the right to use a locomotive engine, traversing on one or more rails raised above the water, or placed at small distances below it; such engine being propelled, if necessary, by the adhesion of its own wheels."

Various contrivances have been made for applying the motive power on board of steam-boats otherwise than by paddle wheels; as, for example, by a chain or rope along the canal; by wheels acting upon the bottom, or upon the tow path, and by logs lying along the middle, having racks upon them, into which a toothed wheel might work; the present plan we believe to be new, and the main if not the only difficulty in the way of its adoption, is that the canal and boats must be constructed exclusively with a view to it.

IMPROVED MODE OF MAKING POTASH —*Ephraim Parce, Chenango county, New York.*—The improved mode of making potash is said to consist of two parts. First, in applying lime and salt dissolved in water, at a boiling heat, to crude ashes. These agents, it is stated, have both been previously employed, but not at a boiling heat, and it is in this that the improvement in part consists. The mixture may be made in different ways, but the mode preferred is the combining the lime and salt in proper propor-

tions, dissolving and pouring them on the ashes at a boiling heat. Fifteen pounds of salt, one bushel of lime, and eighty gallons of water, may be used with twenty bushels of common house ashes; but these proportions admit of considerable variation.

The ashes being thus prepared the second part of the process commences; this consists in the pouring cold water upon the ashes thus prepared, which will leach them more effectually than has been heretofore done.

The directions given for carrying the process into effect, are as follows :—

With twenty bushels of ashes, prepare the leaches with lime bottoms in the usual way; bring the salt and water to nearly a boiling heat, and then add to it the bushel of unslaked lime, which will immediately cause it to boil. Upon the first layer of ashes, which may be four inches deep, pour as much of the heated mixture as will thoroughly scald it; go on thus with fresh proportions until the whole of the ashes are thus scalded. With field ashes the salt is to be reduced one-half, and the lime increased one-fourth. The ashes are to be covered with cold water until it rises two inches above them, and kept so covered until they are exhausted, which will require eight or ten hours. The boiling and melting are then to be proceeded in.

A Weathercock Wheel—*N. T. Davis, Wilmington, Vermont.*—This machine is intended to be one of no ordinary character, as it is "to carry any and every kind of machinery by wind or water; also to propel boats and every other kind of water craft by wind," an article much cheaper than wood or coal, whilst the apparatus through which it is to operate will also be much less costly than a steam-engine.

The weathercock wheel, when acted on by wind (as weathercocks usually are), is, in fact, a vertical windmill, having four sails, which are quadrangular, and turn upon gudgeons in suitable arms; the gudgeons not being placed in the middle of the upper and lower edges of the sails, but nearer to one end than to the other, that the wind may always direct them in one way. There is a stop, or button, upon the arms, to hold the sail when under the action of the wind, and there are ropes leading from their ends to the vertical shaft, to govern their motion.

In what particular all this differs from many other vertical windmills, we do not know, and are not likely to learn.

A wheel made in the same way is to be placed in the tide, or current, of a river, where it will run as well, and do as much work as many similar wheels have done before it; and why it should do more we know not, as it is exactly like them. In several instances they have certainly answered as well as we have led the proposers of them to anticipate, but still, this has been so badly, that they have been all thrown by as useless. The patentee, no doubt, prophesies more favourably of the one before us, or rather did so in January last; if, however, he has been working, or labouring, with it ever since, he has encountered unexpected difficulties, which will not be easily overcome, as they are inherent, and therefore, like chronic complaints, very obstinate in their character.

This wheel, however, is destined, or rather designed, to perform a more noble office than that of a mere wind and water wheel; it is to propel boats, and thus take the place of the steam-engine. The said vertical wind wheel is to be placed within the boat, and geared to the paddle wheels; when, should every thing operate as intended, the boat will be thereby propelled. Even here, unfortunately, if a worthless contrivance can be called unfortunate, the invention is not new; it has been proposed hundreds of times, and even patented more than once. Those who cannot perceive the utter futility of such a plan, have more to learn than we can attempt to teach them.

NOTES AND NOTICES.

Disfigurers of Architecture.—There are a great variety of these creatures who are always at their dirty work. Some may be called tinkers, some blacksmiths, some jobbing bricklayers or Irish labourers, some daubers, and others hedge carpenters. One of the latter class has recently, by the command of His Majesty, been ordered by Augustus Frederick, Ranger, to disfigure the gateways and lodges in the parks, by a number of huge boards and posts, stuck up without any regard to symmetry. However, it is supposed, that neither His Majesty nor the Duke of Sussex can have any idea how much they injure the architectural appearance. If drawings had been made of the several gateways, showing the effect of these boards, as they are seen from different sides, they would never have been ordered to be put up. It is to be hoped they will not be suffered to remain. There are porters—let them do their duty, and the boards are unnecessary. J.

It is very much to be regretted that *now*, while they are cleaning and painting Burlington-arcade, they do not take the opportunity of removing those great unsightly iron bars (large enough for suspending rods for Hammersmith-bridge), which have been put up by the blacksmith to support the lamps; which lamps, by the way, as they are now arranged along the middle, have, with the irons that support them, a very bad effect on the architecture, the height appearing very much diminished, and every line in the roof as if broken. It is only necessary to compare this with some of the other Arcades, which have the lamps at the sides, to be satisfied that the latter is by far the best way of placing the lamps.

If, when we last noticed the improvement that had been made in the chimney-tops at the "New

State Paper Office," we had been aware that it was the intention to employ the slater or blacksmith to put caps on them, our approbation would not have been so strongly expressed. If this addition to a few of the chimneys has been made under the direction of the architect, he would very much oblige some of our readers if he would have the goodness to describe the use, if any, of such terminations.

Zincography. — M. Breugnot, an ingenious Frenchman, has succeeded in preparing a composition of metal, the basis of which is zinc, upon which drawing and writing can be effected with equal facility as on stone, and as easily applied to paper with the same machinery. It has been said that this art will supersede lithography, over which it has several advantages; amongst others, its superior portability and cheapness. The plates can be adapted to a lady's portfolio. The invention has been sanctioned by the Royal Academy of Paris. M. Breugnot has sold the patent for Great Britain to Mr. John Chapman, of Cornhill.

Mortality from Fire-damp and Choke-damp.—It appears, from a return of the number of persons who have been killed in the mines and collieries of England and Wales, since 1810, by fire and choke-damp, that no less than 1,028 lives have been sacrificed in that manner in these 24 years. The number, large as it is, does not include the whole of the fatal casualties, as from two of the mining counties, Durham and Worcester no returns have been made, and those from Cheshire, Lancashire, Stafford, Northumberland, and Brecon, are incomplete, some going no farther back than 1818.

Conversion of Salt Water into Fresh.—An important and completely successful experiment has lately been made by Mr. Wells, as to the conversion of sea water into a perfectly fresh and pure liquid, fit for every purpose of domestic use. The apparatus consists of a cast-iron cooking machine, about four feet in height, and the same in width, and contains ovens, roasting fires, pots, pans, kettles, &c., sufficient to dress a dinner for seventy or eighty men. The consumption of fuel is about two bushels in twenty-four hours; and by the internal application of the heated air, by means of tubes surrounding the various parts of the machine, roasting, boiling, and baking, are carried on with the utmost regularity and precision. Whilst the cooking is proceeding, the sea water is gradually supplied from a cask or tank, and passing into the interior of the machine, is there submitted to distillation. In its distilled state it flows into a pipe of cast iron, or of copper tinned, which pipe is led over the bow of the vessel, and along the cutwater into the sea, and thence along the bottom of the vessel till it returns into the hold, where a common stop-cock draws off the water. The grand improvement is the making the element in which the vessel floats the condenser of the altered liquid, which runs off at about the rate of a quart a minute, perfectly fit for drinking, washing, or any of the other purposes for which fresh water is employed. The patentee then filters it through charcoal, to restore the carbon, which has been lost in the distilling. This invention will render the watering of ships unnecessary, and the room hitherto required to stow water may be used for goods.—*Literary Gazette.* Would not the room required for the stowage of fuel to carry on the process be equal to that required for water?

"What has become of Mr. Badnall and his Undulating Railway System?"—In answer to this question, put to us by a correspondent, we have to say that, according to our last advices from Manchester (of date Sept. 23), Mr. B. was still awaiting the loan of a suitable locomotive engine from the Liverpool and Manchester Railway Company, to try his proposed series of decisive experiments on the Whiston Branch Railway. We may add, that this branch railway, which, it will be remembered, is partly on the undulating plan, is now regularly at work. The waggons descend from the Whiston collieries by their own gravity, and rise to a proportionate elevation (less friction) on the opposite ascent. Horses are then employed to carry the loads to the junction of the Liverpool and Manchester railway.

Thames Tunnel.—Mr. Brunel stated, at one of the evening meetings of the British Association, at Edinburgh, that Government had consented to advance the sum which would be sufficient to complete the tunnel.—*Edinburgh Paper.* But Mr. Brunel forgot to add, that if Government advance the money—which is not yet *quite* certain—it is to be on the condition that Government shall have a preferable claim to the first proceeds of the tunnel, which, according to Mr. Brunel's own estimates, will not pay more than 4 per cent. on the sum (above 200,000*l.*) still required for its completion. It is for Mr. Brunel's glory (England's glory too, if we might believe Mr. B. !) that the tunnel should be completed; but as far as the poor shareholders are concerned, it is a matter of the purest indifference what becomes of it. The money they have sunk is *literally* sunk—sunk beyond all possible redemption.

On Monday last the Edgeware-road was newly covered with Macadamised gravel, from 4 to 5 in. deep. This was a trial for Mr. Hancock's "Era," and many considered it an unfair one, on account of the unusual dpth of the new metal; but, nevertheless, the gear was changed from the quick to the slow motion, and she passed over it with ease, and has every day since. The length of road so covered is only from Southampton-row to Chapel-street, but one of the omnibuses stuck in it, and was obliged to have an additional horse to drag it out.

Exportation of English Machinery and Mechanics.—We learn from Calais, that a vessel lately departed for St. Petersburgh with fifteen machines for weaving net-lace, and as many English weavers with their families. It appears, that a French merchant is about to introduce the manufacture of this article into Russia, where English cotton suited to its fabrication, has just been ordered to be admitted without the payment of any duty.—*Galignani's Messenger.*—Another striking illustration of the policy of our law against the exportation of machinery. You will not allow machines to be exported, but you allow (because you cannot prevent) the hands who make and use them, to go where they please. The fifteen machines alluded to were made by English mechanics, who have settled at Calais, to escape the operation of the absurd laws of their own country.

Communications received from Mr. Aldersey —Mr. Geo. Wm. Wood—T. G.—A Southron—W. A. R.—Enort—O.—Mr. R. Smith—Pit—Mr. Evans.

The Supplement to the present Volume, with Preface, Titles, and Index, and Portrait, on Steel, of the late Mr. Telford, will be published on the 1st of November.

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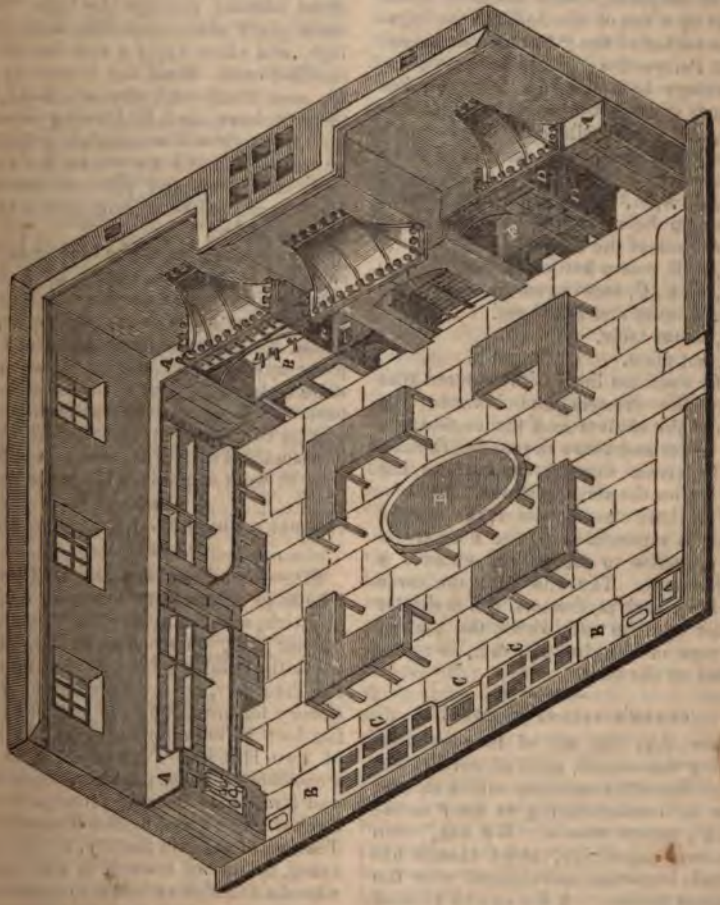
THE ROYAL KITCHEN, BRIGHTON.



THE ROYAL KITCHEN, BRIGHTON.

To those who may be curious to know how that most useful apartment in a house, the kitchen (study scarcely excepted), is constructed in the first house of the land, the engraving on the preceding page will furnish—if not as complete a description as could be desired—at least a very interesting bird's-eye view of the whole affair. It is a representation in isometrical perspective, of the principal kitchen of the Royal Pavillion at Brighton, which has been made for us by a son of Mr. Jopling, the ingenious author of the "Practice of Isometrical Perspective;" and shows to great advantage both the superiority of this manner of exhibiting architectural interiors, and the excellence of the culinary arrangements, in the particular case before us.*

A, A, A, A, are steam warm closets, the steam being supplied from a boiler at the back of the range.

B, B, B, steam kettle dressers.

C, C, C, C, stewing stoves.

D, D, oven and hot closet.

E, steam table.

F, hot plate.

The walls are lined with coloured tiles under the dressers, and between the ends of the shelves and the cupboards; also under and above the marble skirting to the steam dressers, and above the skirting on the stewing stoves.

Over these stewing stoves, the plan of which is represented on the floor at the side opposite to the range, extends a long canopy. The end with the three windows, shelves, dressers, &c. is similar to the opposite end, where the plan of the tops of the dressers, &c., is represented on the floor.

CLARK'S PATENT BLOWER.

Now that the use of fires is again coming into season, such of our readers as are domestic economists will be obliged to us for recommending to their notice Clark's patent blower. We can, from our own experience, attest that it has several important advantages over the common bellows. A fire can be kindled by it in one minute with a few shavings and small coal; and you have but to apply it for a few minutes longer, to have as large and blazing a fire as you can possibly want, for any purpose, whether of warmth or of cookery. A good deal of both time and money are thus saved, with a great addition of comfort to both servants and master.

To make a good fire in one minute, says the patentee (and we find he says truly), you have only to attend to the following directions:—"Put a few small coal in the bottom and back part of the grate, if empty, to prevent the heat and flame blowing through the bars. Over these place some clean dry wood shavings, and above apply a very few of the smallest coal. Hold the blower by the top part firmly with the left hand, on the left knee, and by blowing one minute the coals will be completely ignited. If too many coals are put on the shavings, they drop and put out the fire. Half-burnt coal, or cinders, should never be used at first."

The construction of the blower is very simple. It consists merely of a long tube, which communicates with a circular chamber at its lower extremity, in which chamber a fanner is turned rapidly by means of the hand, so as to drive a strong current of air through the tube. Nothing can be easier than the process of working it, and the effect is as if two or three pairs of the common bellows were at work to produce the same result.

CHILDREN CHIMNEY-SWEEPERS — SIXTH LETTER.

Sir,—Mrs. Elizabeth Dennis Denyer, who lived formerly at Chelsea, then at Dulwich, and last in Mecklenburg-street, by her will, dated August 16, 1821, made the following bequest:—"I give to the Treasurer, for the time being, of the Society for preventing the use of climbing boys as chimney-sweepers, the sum of Two Hundred Pounds stock, in the Consolidated Three per Cent. Annuities; and I will that the said principal sum in stock shall be given by the Treasurer or Trustees of the said Society, for the time being, by way of reward, to any person who shall invent or bring to perfection, any machine which shall be approved of by Parliament, and which shall thereby prevent the use and employment of climbing boys for sweeping chimneys; and, in the meantime, I will that the annual dividends and interest of the said

* *In the last Number of the Architectural Magazine there is a paper of Practical Hints on Domestic Offices—kitchen included—by Mr. J. Kent, Architect, well worthy of perusal.*

Two Hundred Pounds stock, shall be applied to the general uses and purposes of the said Society, or in any way that may conduce to the amelioration of the unfortunate boys so employed."

I hope the magnitude of the reward will sharpen up the wits of your inventive readers. I think there must be a further Act of Parliament on the subject of chimney-sweepers: by such an act the 200*l.* stock would probably be awarded.

Since my last letter was written I have become possessed of the following document:—

"London, Sept. 15, 1834.

"Sir,—We humbly take the liberty of addressing you, trusting you will not deem us intrusive, relative to the Act of Parliament for the better regulation of chimney-sweepers, their apprentices, and for the better and safer construction of flues.

"Your Company are aware of the heavy expenses we were put to in the year 1818, in opposing the Bill to supersede the use of boys, when *the different Fire Establishments*, in a manner for which we shall always feel grateful, came forward to give evidence, and also their pecuniary assistance; the same measure brought forward by the same gentleman has been again attempted, *and found totally impracticable*, in *proving* which we have been again put to a most serious inconvenience and enormous expence, to defray which we have been under the necessity of memorialising the Lords of his Majesty's Treasury, whose reply stated they were not empowered to assist us. We are, therefore, again compelled humbly, but most earnestly, to solicit your assistance in defraying the expenses of counsel, agent, witnesses, house and committee fees, &c.

"If the Board of Directors will condescendingly take into consideration the ruinous situation in which we are placed, we shall for ever feel most grateful.

"We have the honour to be, Sir,

"With the greatest respect,

"Your very obliged obedient servants,

"BENTLY AND DUCK."

"24, Brick-street, May-fair,
To the Protector."

This letter, addressed to "The Protector" (not Oliver Cromwell), is one of a set of circulars sent to some of the Fire-offices. In 1818, unquestionably, Smart's machine being inferior to that of Glass, which was not then invented, and the *subject being less understood than it is now, five of the Companies* appeared by their officers before the Committee, and gave evidence to the effect that climbing boys could not altogether be dispensed with for some purposes; and two of the same individuals, who gave evidence on the former occasion, have also been brought forward on the latter. One of these says now—"I cannot say that the increase of danger to property is of such consequence as to affect the Public Companies; but," he adds, "I think that it affects life more than property;" from which I infer that he thinks the fire would prefer burning the inhabitants, and not dip into the fund of the Insurance Company by burning the house. The other witness admits that his office has not increased its rate of premium.

What Messrs. Bently and Duck obtained through their letter, I do not know; very little more, I have reason to think, than they obtained from "the Lords of his Majesty's Treasury;" if more, then so much more than they ought to have obtained. Let us see who and what they are. In the first place, they are both master chimney-sweepers employing climbing children. Secondly, they themselves never were climbing boys. Mr. Bently never tasted the sweets of the interior of a chimney. The utmost extent of Mr. Duck's personal acquaintance with the black hole appears to have been, that he repeatedly, for wagers, did the chimney of his mother's back-parlour, in competition with the children employed by her. Of sticking in chimneys, getting sore knees, being burnt, beaten, starved, left unwashed, and so on, they have had no practical experience in their own persons; and, I will do them the justice to say, I believe they would not wantonly make those under their care suffer such hardships. But they are not disinterested in the matter; and I take leave to say their evidence against the bill weighed nothing with me. I bring them and their letter forward only to show the implacability of the master chimney-sweepers on the subject of the plan of superseding, by machinery, the employment of climbing children. You will observe they say, in their letter, the plan is found to be *totally* impracticable. Totally impracticable! Why, Mr. Bently, in his evidence, when examined by his own counsel, says that four or five chimneys may be swept by the machine; that of

the other fifth of the whole number, some might be remedied by putting in doors at particular points; and, at last, we find that it is only in some handsome rooms that doors cannot be conveniently placed. Mr. Bently, too, says he uses the machine when it is required. So much for *his* total impracticability.

Now for the *totally impracticable* Mr. Duck. Will it be believed that Mr. Duck writes himself up on his place of business, which is almost as handsome as either of the gin palaces in his neighbourhood, in fine well-cut stucco letters, nearly as large as any one of his *bare niners*, MECHANICAL CHIMNEY SWEEPER? This announcement is well calculated to procure him employment from all those who think the use of a machine less cruel than the use of children, and who are content to lie snug in their beds while their chimneys are swept—they know not how. But does he use the machine where he can? I have enquired at houses where he works, and I have not found in any one instance that he has used it, nor recommended it, nor even mentioned it. I have been in the habit, for some years, daily, and commonly several times during the day, of passing by the street in which his place of business is, and I have never seen a machine there or in his neighbourhood, although there is another large master chimney-sweeper living near him. Yet he says, in his evidence, that he uses machines in his busines, both Smart's (why Smart's, now?) and Glass's; and that ten in a hundred chimneys could not be swept without a boy. And so much for Mr. Duck's *total impracticability*.

I must, however, go a little further with Mr. Duck. He stated that he had been called in to put out a fire in the counting-house chimney at Messrs. Corbyn's, the well known chemists, in Holborn, in November last, and that (for, to be sure, the fire must have resulted from the use of the machine) those gentlemen had swept with machines for some years past. In discharge of the duty I had imposed upon myself, I called on Messrs. Corbyn, and investigated the affair. In consequence of this investigation a member of their establishment attended the Committee, and deposed that the chimney had not been swept *at all for fifteen months*, it had been *neglected; that there* had been a fire kept up in it all the winter, and every Sunday throughout the year; that it used to be swept sometimes by machines, and sometimes by a boy; but the last time previous the witness did not know which it was,—they changed in the house from boys to machines, and the house department had been swept by machines for five years past, and there had been no fire there; and it was intended that the counting-house generally should be under the same, but that the chimney-sweeper, whose name was Day,* was not aware of it, and it was neglected in consequence a good while; that the chimneys in the house were then swept by machinery; that they were perfectly satisfied with the use of it; and that their chimneys neither smoked nor took fire. More *total impracticability* you see.

Let but housekeepers in general employ for a time no sweepers but those who use the machine exclusively, and the impracticability of Messrs. Bently and Duck, and of their constituents, will soon vanish.

There is a class of sweepers who are not householders, but who, having fixed places of residence, are not itinerants. They are in number not fewer than eight hundred. They are, as may be supposed, poor men, and not having the stuccoed lettered front, and fine large lamp of Mr. Duck, they have been obliged to get employment by calling the street. These persons are desirous, as a deputation of them have told me, to use machines alone, and I wish housekeepers could be prevailed on to seek them out, and employ them. They have been climbing boys themselves, and know the miseries of that state, and when the deputation was with me they intended, and I believe still intend, to petition, next session, for an Act totally to abolish the use of climbing boys.

While I have been engaged in writing these letters, the Nineteenth Report of the Society for Superseding Climbing Boys has come out. By it, I regret to see, the Society entirely disclaim the Act which has been passed, as not going the full length they desired. This affords me an opportunity of doing justice to

* Day sweeps with the machine exclusively. It is to be concluded, therefore, that the counting-house chimney had been swept only by children before the fire took place.

Mr. William Tooke, the member for Truro, by whom the Bill was introduced into Parliament. That gentleman was, as I well know (for I was a humble second to him), indefatigable in his exertions to pass it in a state such as would have satisfied them. He had been thirty years an advocate for the abolition of climbing boys, as full of *zeal* as any one of them. As for *discretion*, I cannot but think that if they had heard the earnest recommendations of some of the most able tacticians to be found among the members composing the House of Lords, they would have been well content to take, in the way of legislation, what they could then get; looking forward, with reasonable hope, to get more thereafter; rather than obtain no Act at all, so leaving themselves with the melancholy prospect before them, that for years to come no one would be found willing, and able, and hardy enough, to incur the labour, the very great labour, and difficulty of conducting such a measure through Parliament. I think the community is greatly indebted to Mr. Tooke, and that the Society ought to feel itself so likewise.

Repeating my thanks to you, sir, for your patience, and apologising to your readers for having kept them so long up the chimney, I shall now pack up my brushes, shovels, and sacks, and make my escape, as Mr. Glass says, " from soot and sooty scenes."

I am, Sir,
Your obliged and obedient servant,
ARCHIBALD ROSSER.

15, New Boswell-court,
October 3, 1834.

P. S.—The notice which your correspondent, Junius Redivivus, has taken of these letters, and his kindness in forwarding my views, are highly gratifying to me. Embarked in what I believe, to be a good cause, I have thought little of the trouble of ranging to and fro, through a tolerably thick volume of evidence, and committing the results of the examination to paper. If I had felt that trouble great, however, I should have been rewarded for it by the approbation of such a writer and thinker as Junius Redivivus. May I hope that he will continue to employ his active and powerful mind on the subject of chimney sweeping?

Junius will, I trust, excuse me if I *express regret that he should* have made any allusion to political party in reference to this subject. I myself have the misfortune to be one of those unhappy beings called Tories—and, what is worse, a rank one. I can assure Junius, however, that although individuals of all parties lent their assistance, ably and effectively, in investigating the sweeping of chimneys, those who took the most active part on the occasion were Whigs. But a fig for party names, while we are in the common cause of humanity.

I will just add, that I have intended no disrespect to any person whom I have been obliged to name in these letters. The appearance and demeanour of the master chimney-sweepers whom I saw in attendance on the Committee, was highly gratifying. It plainly showed that matters were not so bad in the trade as they had been before the society existed. But matters not being so bad, or say, if you will, " improvement," will not do for me; and they must excuse me, if I have endeavoured, by a gentle violence, to drive them to that which I know it is their interest to resort to at once, and freely—the use of the machine. What would they think of it, if a well-organised company for sweeping chimneys by machinery were to be formed, and to parcel out the whole metropolis into districts, furnishing each with a station from which it could be constantly and amply supplied with honest, cleanly, and skilful machine chimney-sweepers?—Othello's (it is a *soot*able name) occupation would be gone.

ON SUBSTITUTES FOR RAGS IN PAPER-MAKING.

Sir,—Your correspondent " Enort," at page 426, says, that " few persons are aware that the vegetable rush, which is afterwards formed into Russia matting, is a suitable material for making paper." I think, however, that this inference is hardly warranted, as I should suppose that all tolerably well-informed persons are acquainted with the general principles of paper-making, and are cognizant of the fact, that *all fibrous materials* are suitable for this purpose. Many persons, however, are not aware of the reason why this well-known fact is not more generally acted upon; and perhaps the following remarks may convey a little information to your readers on this

subject, and throw an additional light upon the communication alluded to above.

The fibrous materials found among the productions of the vegetable kingdom are innumerable, and the number of them that have at different times been used for the manufacture of paper exceeds belief. The bark of the willow, the beech, the aspen, the hawthorn, and the lime, as well as deal and other shavings, have been made into tolerable paper; the tendrils of the vine and the stalks of the nettle, the mallow, the thistle, and many other plants, have been used for a similar purpose; the bine of our own hops, it is affirmed, will produce paper enough for the use of England; and several patents have been granted for making paper from straw.

During the period of the war, when rags were extremely scarce and valuable, from the interruption of the continental supply, and from other causes, paper-makers endeavoured to discover a material that might be used as a substitute for, or in conjunction with rags. High as the price of rags was at the period referred to, very little benefit resulted from the means thus resorted to for eking out the supply. The time and trouble occupied in bringing the various substances into a fit state for the subsequent process, greatly increased their original cost; for all vegetable substances must undergo a *fibrating process*, after the manner in which hemp is treated, before they are fit for making paper. The "large broad leaves," of which your correspondent speaks as being so extravagantly wasted at Duke's-place, Covent-garden Market, &c., are, doubtless, capable of being manufactured into paper, but the writer is mistaken as to their value; very few paper-makers would take the trouble to prepare and use these leaves if they were given to them at the mill—most assuredly none would give "*a recompensing price*" for them, and incur the expense of carriage home.

Next to rags, paper shavings are the most eligible, and at one time these were bought up by the paper-makers with great avidity at a remunerating price, but of late years shavings have fallen into disuse, partly from the loss in cleansing, &c. and from the shortness of the twice *cut fibre impairing the* strength of the *papers made of this material*; and shav*ings are now scarcely* worth saving.

I have seen a very pretty paper made entirely from wood shavings, and also from straws; I have a sheet of brown paper made from the refuse of Mr. Cobbett's Anglo-Indian corn, but, judging from the price charged for it, it would be difficult to manufacture paper from this material at the market price of good rope paper.

All the experiments hitherto made, upon the fitness of different materials for the manufacture of paper, merely serve to show the curious what can be done, but afford no real assistance to the manufacturer in his endeavours to furnish the public with the best possible article at the lowest possible price.

The writer of an article on paper-making, in No. 96 of the Penny Mag., puts forth the following curious speculation:—

"The process of bleaching the coarser rags, so as to render them fit for purposes to which only those of the finest qualities were formerly applied, will, however, render the use of these inferior substances (substitutes for rags) unnecessary for many years. But the time may probably come when we shall obtain no rags from other countries. The advance of a people in civilisation has not only a tendency to make the supply of rags abundant; but, at the same time, to increase the demand for rags. The use of machinery in manufactories renders clothing cheap; the cheapness of clothing causes its consumption to increase, not only in the proportion of an increasing population, but by the scale of individual expenditure; the stock of rags is therefore increasing in the same ratio that our looms produce more linen and cotton cloth. But then the increase of knowledge runs in a parallel line with this increase of comforts; and the increase of knowledge requires an increase of books. The principle of publishing books and tracts, to be read by thousands instead of tens and hundreds, has already caused a large addition to the demand for printing paper.

"In 1829 the excise duty on paper amounted to 728,000*l.*; in 1832 to 815,000*l.* If, therefore, the demand for books, not only in England, but in all civilised countries, should outrun, which it is very likely to do, the power of each individual to wear out linen and cotton clothing to supply the demand, paper

must be manufactured from other substances than rags."

When this state of things comes about, the Jew boys may turn a penny by collecting orange packing, and such like matters; but the time is not yet.

I remain, Sir,

Yours respectfully,

WM. BADDELEY.

London, Sept. 24, 1834.

MR. NUTT'S SYSTEM OF BEE MANAGEMENT.

Sir,—After the notice of Mr. Nutt's intended publication of a Treatise on the Management of Bees, I anxiously waited for its appearance, and became possessed of a copy. After reading it through I wrote him a long letter, inquiring the cause of the opposition he stated he had met with, and offering my services gratuitously to introduce his system in the West of England. This letter Mr. Nutt (in an answer to a letter sent subsequently to his agent in London,) says he never received, and as the dead-letter office has not returned it, the inference is that it must have been improperly intercepted by some one—by one of those, perhaps, whom Mr. Nutt classes as his very "particular friends." Be this as it may, a misunderstanding between us has been the consequence, and our correspondence has ceased. I shall say little now either of Mr. Nutt as an author, or of his friends who defend him. My purpose in addressing you is simply to state a few facts favourable to Mr. Nutt's system, which have come within my own experience, and which seem to me to invalidate the principal objections brought against it by your anonymous correspondent J. P. T. Nor should I have condescended to answer a person, who seems afraid to be known in his attacks on an inoffensive individual, were it not that the Editor of the Mech. Mag. has in a manner identified himself with J. P. T., by the note which he has subjoined to one of his communications.*

First, then, as to "swarming from necessity or choice." I have two sets of collateral boxes, one stocked on the 24th, the other on the 28th of May last. The bees have filled the first with combs and honey entirely. One side box is full of combs, and partly full of honey. The bell-glass is about one-third full of combs, and partly supplied by honey also; my bell-glasses will contain twice as much as the largest I have seen from Mr. Nutt. From this it must be evident that my bees must have swarmed "from necessity," had I not prevented this by the "move" recommended by Mr. Nutt, or some thing else tantamount to it. That they did not *choose* to swarm is evident from the work they performed after an enlargement was granted them. The swarm in the second set of boxes has filled the centre box, and the glass just the same as the other; added to which, each swarm has partly filled another box, and then returned to the colony (see hereafter).

Mr. Nutt's glass on the centre box is not an abandonment of "his so much lauded ventilating system," that glass being itself also ventilated.

The comparing Mr. Nutt's prevention of swarming to a farmer preventing his ewes having lambs is not good reasoning. If a farmer could make his ewes to produce mutton and wool without the butcher's knife, then the cases would be parallel; but Mr. Nutt's plan is to get the honey without killing the bees. The moment the bees become too numerous, for the box where they are first located, they are permitted to enter another box that is empty; the full one has its contents removed, and again is replaced on the stool until wanted, and so on. How, then, can the comparison be borne out?

I do not know what Mr. Huish means by his bees being "very lively," when the thermometer fell 20° below freezing. My bees are never *very active* when the thermometer is 20° above freezing. I would also add, that I attribute my success in keeping bees, when many of my neighbours lose them, to the simple circumstance of mine being out of the influence of the sun during winter; in fact, my hives are for weeks, and even months, together, as still as if no bees were in them.

In reference to moving bees we pay no

* Not so; we only so far sided with our correspondent, as to say that his strictures had led us to think less favourably of Mr. Nutt's system and his book than we originally did, and that these charges had not been met as they might and ought to have been—if *unfounded*—by the two other correspondents who undertook Mr. Nutt's vindication, and who, we *may add, are persons that* must be able,—*if any body can—to vindicate it* most effectually.—*ED. M. M.*

attention to it in this part of the country; we move them to suit our convenience, as in changing of residences, selling or exchanging hives, putting them out on the half, and so on—never supposing but what bees can find their way back to any place from whence they have once started; we always, when we do remove them, do so after they are quietly housed at night.

Your correspondent says, "Mr. Nutt has so mystified the description of his hive, that no person in the world can understand it." Now mark this, sir; my boxes were all made with their appendages according to the directions and plates given in Mr. Nutt's Treatise, *since which*, I have seen a set from Mr. Nutt, sent to a lady near Penzance, and I find that I have not mistaken him in any one point. So much, then, for your correspondent's acuteness of perception. Another striking proof of it is, that he cannot understand the size of the dividing tins to be inserted between the boxes, when preparing to take off a side-box. Of what size should they be? Surely, long enough and wide enough to stop the communication between the two. Attend again to what he says of regulating the temperature,—"After all the fuss, too, about thermometers, there is no mention made in this chapter, nor any part of the book, where they should be inserted into the hive." Why, into the ventilator, to be sure, which is a perforated tin tube, placed there on purpose.

To show, further, how carelessly, as well as with what prejudice, your correspondent must have read Mr. Nutt's treatise, he calls a mere block, or door, if you please, a drawer in common with the feeder, which is a drawer. These block fronts I used this season, to try the experiment of taking off a side-box, in which I so far succeeded that I did not injure a SINGLE BEE, that I could discover. I introduced the dividing tins carefully and slowly between the boxes, as directed by Mr. Nutt, although your correspondent says Mr. Nutt gives no such directions. There is no framework needed to support the combs: this I have proved over and over in cottage hives, and never even put a pin through the crown, as some persons do. I have proved it also in the boxes and glasses to *my entire satisfaction*. My bees, on being admitted into a side-box, will take possession without "coaxing" at all. I take the box, clean it well out, rub it with a little honey, the smell of which will remove all other, if any existed, though I know not that it is at all needful; but we always prepare cottage hives to receive a swarm by rubbing it with something to make it grateful to them. I should think in about two or three hours after the communication was opened, in the three cases I tried, bees to the quantity of good swarms took possession of the boxes, and remained quietly to work as in the boxes they before occupied.

I do not recollect Mr. Nutt saying "he cannot himself, without great difficulty, take a box away from his own hive." I had no difficulty, danger, or accident to myself, or to the bees, in two experiments tried this season—the boxes with the combs still remain for inspection. Your correspondent also says, in reference to Mr. Nutt's letting a swarm hang with a sheet before them until evening, that "my bees with such treatment would have fled away." A man I know in Breage, told me this summer that he has frequently shook his bees after he had returned from Wheal Vor, a distance of three miles, after six o'clock in the evening, and on one occasion they swarmed so early as nine o'clock in the morning. The first swarm of my own, alluded to above, swarmed, and settled in an apple-tree; after which a messenger was procured, and sent to me then two miles off. I went myself, and shook them in Mr. Nutt's box for the first time. The reason was, I had the key of the room in my pocket, and my friends could not get at the box. The man's bees, above noticed, were left so long, because his wife was afraid of them, and his dwelling was in a lonely place.

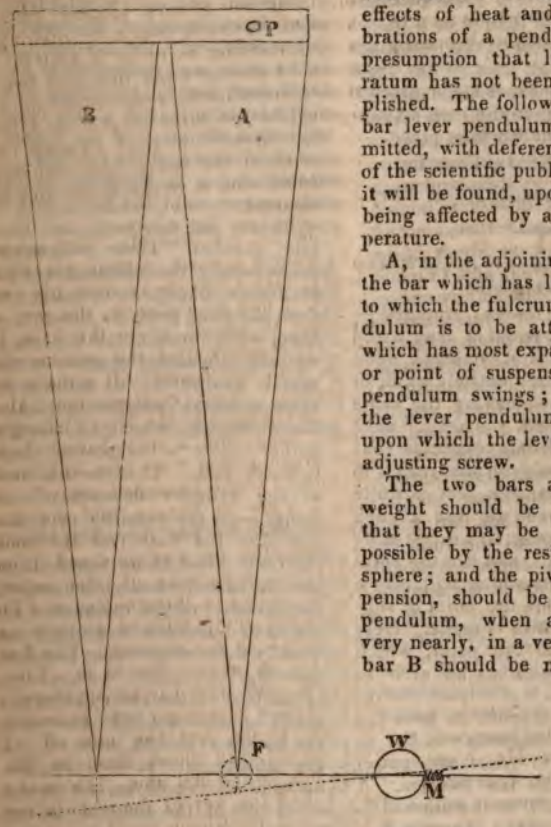
The above are facts that may be doubted, but cannot be disproved. Another season I may, if you desire it, favour you with my further progress; or I may in the mean time, with your permission, point out some other matters your correspondent has very much erred in.

GEORGE WILLIAM WOOD.

Germo, near Helston, Cornwall,
Oct. 1, 1834.

DESCRIPTION OF A DOUBLE BAR LEVER PENDULUM, THE OSCILLATIONS OF WHICH CANNOT BE AFFECTED BY ANY CHANGES IN THE TEMPERATURE OF THE WEATHER.

BY CAPTAIN W. FORMAN, R. N.



The numerous attempts that have been made to counteract the different effects of heat and cold upon the vibrations of a pendulum, amount to a presumption that hitherto this desideratum has not been completely accomplished. The following plan of a double bar lever pendulum is, therefore, submitted, with deference, to the judgment of the scientific public, in the hope that it will be found, upon trial, incapable of being affected by any changes of temperature.

A, in the adjoining figure, represents the bar which has least expansion, and to which the fulcrum of the lever pendulum is to be attached; B, the bar which has most expansion; P, the pivot, or point of suspension, on which the pendulum swings; W, the weight of the lever pendulum; F, the fulcrum upon which the lever acts; and M, the adjusting screw.

The two bars and the pendulum weight should be made flat, in order that they may be as little affected as possible by the resistance of the atmosphere; and the pivot, or point of suspension, should be so placed that the pendulum, when at rest, may hang, very nearly, in a vertical position. The bar B should be made of some metal that expands and contracts very much, when it is affected by variations of temperature; and the bar A might be made of hard wood, whalebone, or some metal that expands and contracts very little; for the greater the difference in the expansion of these two bars, the nearer the pendulum weight will be to the fulcrum which is attached to the bar A.

In the above figure, I have hypothetically supposed that the degrees of the expansion and contraction of the bar B are just double the *degrees of the expansion and contraction of the bar A: in which case the weight W must be* placed exactly as far to the right of the fulcrum F, as the point of the bar B is to the left of it; and if the difference in the expansion of the two bars cannot be exactly ascertained by calculation, it will only be necessary to swing the pendulum in different degrees of temperature, and occasionally turn the adjusting screw backwards and forwards, until the vibrations, in every degree of temperature, measure the same time. The dotted line shows that, when the instrument is properly adjusted, the mean time of a vibration cannot be affected by any changes of temperature, because,

whatever may be the expansion or contraction of these bars, the pendulum weight must always be at the same *perpendicular* distance below the point of suspension; but it may be necessary to observe that the points of these two bars should never be less than 2 or 3 inches asunder, or, at all events, the pendulum weight should be at least so far from the fulcrum, as to exceed the greatest degree of expansion, in the most expansive bar, that can possibly take place.

WALTER FORMAN,
Commander Royal Navy.

ON THE RESISTANCE OF HOLLOW AND SOLID CYLINDERS.

If this question were proposed — which of two sticks, equal in length and cylindrical, is the easiest to break upon the knee, that which is entirely solid, or that which is hollow, having the same quantity of matter with the other? most people would not hesitate to decide that the hollow stick would be the easiest to break. Nevertheless, the fact is quite the contrary. When we rest a stick upon the knee to break it, we rest it by some one of its points, and it is the point diametrically opposite which will take a circular motion about the point of support, while the fracture is made. Here then is a lever, and this point, which moves circularly, describes an arch so much the greater, as it is further distant from the point of support, or from the fixed point, and consequently it has so much more force to resist the power which tends to make the fracture. A thicker cylinder, full, is the more difficult to break, not only because it contains more matter upon which we must act, but also because the diameter of its base is greater, and the extremity of its diameter, which moves in the fracture, is further distant from the fixed point. If this cylinder, preserving the same quantity of matter, became hollow, it is visible that its total diameter, that is, the diameter as well of the hollow part as of the solid, would necessarily increase, and consequently only one of the causes which made its force and its resistance against being broken. Every hollow cylinder is then stronger than a full cylinder, which has only the same quantity of matter; and this, according to all appearance, is one of the reasons why the bones of animals and the culms of corn and grass are hollow.

Galileo, the first philosophical inquirer into matters of this sort, has considered, in the full and hollow cylinders, having their bases formed of the same quantity of matter, only the inequality of their diameters; and consequently he has established, that the resistance of a hollow cylinder is to that of a full cylinder, as the total diameter of the hollow one is to the diameter of the full one. But this consideration is imperfect in this, that the extensions of the fibres of which the cylinders are composed, are not taken into account. These extensions, and consequently the resistances of all the particular fibres, continually increase from the fixed point to the most distant fibre, which must break first, and which we may suppose is the greatest extension that it can suffer. It is the sum of all these unequal resistances that makes the resistance, which all the fibres together oppose to the power which tends to break them. Thus the total resistance of the cylinder depends upon three things,—on the quantity of matter that composes the base, on the resistance that all these fibres together bring to their extension—and on the magnitude of the diameter of the cylinder. There remains to determine and express geometrically these magnitudes; and it is this that M. Parent has done. The circles of the base of the full cylinders must be made equal to the full bands or zones of the hollow cylinders, and we must find the infinite sum of the unequal resistances of all the fibres, which is a particular case of the general method of M. Varignon.

M. Parent having arrived at a general *formula*, which contains all the possible resistances of hollow cylinders, compared to the full, has calculated upon this formula a table, wherein he supposes that the total semi-diameter of a hollow cylinder is always 100 parts; and that the resistance of the full cylinder, which contains in its base as much matter as the other, is also divided into 100 parts. We see by this table—

1. That in proportion as the hollow cylinder, of which the *radius* can have but 100 parts of a certain determinate magnitude, has more void, and consequently less matter, it makes a greater

resistance than the correspondent full cylinder.

2. That this inequality of resistance always diminishes in proportion as the hollow cylinder is less hollow, and contains more matter: that, for example, a cylinder of which the void is 99 *radius* and 1 in thickness, and to which consequently a full cylinder answers, which is only 14 *radius*, has a resistance which is to that of the full cylinder as 848 to 100, that is, as $8\frac{1}{2}$ to 1; and that the cylinder which has 50 in void and 50 in thickness, and to which a full cylinder of 87 *radius* answers, has a resistance which is to that of the full one only as 121 to 100.

3. That the hollow cylinder of 99 void, the resistance of which compared to that of the full one, which is 14 *radius*, would be, according to Galileo, $7\frac{1}{2}$ times greater, has one $8\frac{1}{2}$ times greater according to the hypothesis of M. Parent, which is also that of M. Mariotte.—*Abridged from the Transactions of the Royal Academy of Paris for* 1702.

MATHEMATICS AND MATHEMATICIANS.

Sir,—I have just read Mr. Cheverton's explanation on the subject of the claims of mathematical science, in answer to my two last short articles. His last explanation is truly worthy of his two preceding articles. When such assertions are called explanations, nothing in nature need remain unexplained. The most important parts of his communication may be easily refuted from some articles in the Mechanics' Magazine—written by whom, do you think, Mr. Editor?—why, by no less a person than Mr. Cheverton himself. So much, in the mean time, for his consistency.

Having shown, in my last communication, that had it not been for the discoveries of Euler on the refrangibility of light (in opposition to the opinion of Newton), the achromatic telescope might have to this day remained a mere speculation, it may not be out of place, before leaving this part of the subject, to mention the great improvements that have been made in these instruments by the late Fraunhoffer, a German philosopher, eminently distinguished for his high scientific attainments and practical skill. He has constructed telescopes with the most perfect object lenses, and of nine times any former dimensions, the power and brilliancy of which surpass all former attempts.

One would be apt to fancy, from the account Mr. C. has given (No 572, page 277, col. 2,) of the way in which the Eulers and Bernoullis amused themselves with their experiments on gyratory motion, *tractory curves** (untractable curves would surely have been a better name for them), unmanageable equations, &c., that they were wasting their time for no useful purpose. He might, with equal propriety, have applied the same terms of ridicule to Sir I. Newton's experiments in finding the deflecting force of the moon, and many more; or to the experiments of Maskelyne, Hutton, and Cavendish, for ascertaining the mean density of the earth. Of course, all these things, according to the Chevertonian philosophy, are mere matters of moonshine. However, be that as it may, no country has done more justice to the mighty discoveries of Euler than England has done. I shall select, for Mr. Cheverton's edification, a few testimonials in his favour, from the writings of some eminent English mathematicians.

Euler, says Dr. Hutton, in his Mathematical Dictionary, "was one of the most extraordinary, and even prodigious, mathematical geniuses that the world ever produced," &c.

"The great cultivators of astronomy," says the late Professor Sir John Leslie, "are divided into two classes—'accurate and inventive observers, and profound and original theorists.' Of those illustrious men who, in the lapse of three thousand years, have devoted their labours to so noble a purpose, we may distinguish a few who have stood pre-eminently above their compeers, as observers, *Hipparchus, Ptolemy, Tycho Brahé, Hevelius, Cassini, Flamsteed, La Caille, Bradley, Maskelyne*, and *Piazzi;* and as theorists, *Copernicus, Kepler, Newton*, and, after some interval, *Clairaut, D'Alembert*, and *Euler*, and in our own times the associated names of *Lagrange* and *La Place.*"

* Perhaps Mr. C. will favour us with the equations of a few of the simplest of these strange curves.

Mr. Peter Barlow, of the Royal Military Academy, Woolwich, in his English translation of Euler's Algebra, after enumerating some of his wonderful improvements and discoveries in almost every branch of mathematical and physical science, thus concludes:—

"Possessing a mind of such wonderful comprehension, and dispositions so admirably formed to virtue and happiness, Euler found no difficulty in being a Christian; accordingly his faith was unfeigned, and his love was that of a pure and undefiled heart. The advocates for the truth of revealed religion, therefore, may rejoice to add to the bright catalogue which already claims a *Bacon*, a *Newton*, a *Locke*, and a *Hale*, the illustrious name of *Euler*.

"The character of Euler is an object so interesting, that it is difficult to prescribe a limit to reflections when they are once indulged; one is attracted by a sentiment of admiration that almost arises to the emotion of sublimity, and curiosity becomes eager to examine what talents, and qualities, and habits belonged to a mind of such superior powers."

At the period of Sir I. Newton's decease, Euler had just reached his 20th year, and two years before he was hailed by Newton as a rising star of the first magnitude. The whole of his life was devoted to the benefit of mankind, and in the morning of the day on which he died (Sept. 15, 1783), he had been engaged in calculating the orbit of Herschel's planet, and the motion of aerostatic machines.

Mr. C. has associated the names of the Bernoullis with that of the illustrious Euler. The two elder Bernoullis first distinguished themselves by their labours in cultivating the higher calculus invented by Leibnitz; and this powerful analysis was afterwards brought to its present state of perfection by Euler and other continental mathematicians. The fluxionary analysis, invented by Newton, is now, even in England, almost extinct. The long but bloodless war which agitated the scientific world (the war of problems), and the high and commanding position the Bernoullis took in that memorable contest, suffi*ciently demonstrates* their great prowess. John Bernoulli, says Leslie, "spent a long life in extending, by the activity of his genius, every branch of mathematical and physical science. He corresponded with all the foreign societies, and the numerous prizes he bore away proved a source of income. His Treatise on Seamanship came out in 1714, and his Dissertation on the elliptical figure of the planets appeared in 1730. But his various philosophical papers were carefully collected into four quarto volumes, and published, in 1742, at Geneva and Lausanne. He died, full of years and of glory, on the 1st of Jan., 1748."

From the flippant way that Mr. Cheverton speaks of Kepler, one would be apt to imagine that he considered him only as a fifth or sixth rate astronomer. He allows, however, that he (Kepler) *did discover two laws of the planetary motion*, which bear his name. *Two* laws! Pray, does Mr. C. deny one of them? I thought every astronomer had admitted that he discovered *three laws*,—and here they are:—

Law 1st. All the planets move round the sun (or the satellites round their primary) in such a manner, that a line drawn from a planet to the sun describes areas proportional to the time of motion.

Law 2d. The orbits described by the planets round the sun, or the satellites round their primary, are ellipses, having the sun or primary planet in one focus.

Law 3d. The squares of the periodic times of those bodies which revolve round a common centre, are proportional to the cubes of their mean distances from that centre.

Perhaps this last law of Kepler is rejected by Mr. C., as he may have discovered that it is not in accordance with his own theory on the motion of bodies in resisting mediums. I would recommend him to read the Life and Discoveries of the great Kepler, by the Rev. Dr. Small, of Dundee.

I have still, Mr. Editor, some other remarks to make on this subject; and if you will allow me to continue them, for at least one paper more, I will feel much obliged to you. In the mean time,

I am, Mr. Editor,
Yours with respect,
LEWIS FREND.

Basil, Sept. 15, 1834.

THE EARL OF DUNDONALD'S NEW MOTIVE POWER.

The practicability of steam navigation to India by the Cape having recently occupied a good deal of Lord Dundonald's attention, it occurred to his lordship that, though steam cannot be profitably employed, on account of the vast space required for the machinery and fuel, a substitute for steam might be obtained, unattended by any such drawback. The new principle which unfolded itself to his lordship, is briefly this. We know that the equilibrium of heavy fluids can be deranged; and we know also that vessels floating upon the surface of an agitated sea gives occasion to such derangement of equilibrium. Suppose, then, that quicksilver (one cubic foot of which is equal in weight to 13 cubic feet of water) were employed to obtain a propulsive power on board ship, by exhausting air from one vessel and compressing it in another, it would thus form an atmospheric plenum and vacuum, which would produce the same effect as the plenum and vacuum formed by the generation of steam and its condensation. Lord D. does not imagine that such a means of obtaining power could be available on smooth water; but he feels confident, from his extensive nautical experience, that the ocean is rarely so smooth that one atmosphere could not be got from the motion of a vessel, and that at times many atmospheres could be so procured. Air so compressed can also be expanded and condensed by the ordinary and well-known means by which atmospheric engines have been heretofore worked. It is true that atmospheric engines have not hitherto been successful, owing to the magnitude of the pump required to compress the air, and the force necessary to urge it; but in the case Lord D. supposes, the atmospheric air being compressed and dilated by the quicksilver may be expanded and condensed in the usual way by a very small proportion of fuel. It is not, however, absolutely necessary to use fuel at all, because double the number of receivers will perform the same office.

If an apparatus on this plan should not be thought fit to be entirely depended upon, on account of its inoperativeness in perfectly still water, it might at least be used as an auxiliary to save *coals on such occasions* as present themselves by the agitation of the vessel. Lord D. is firmly persuaded that no power that could be produced by steam for any length of time in a vessel, would enable a passage across the ocean to be performed so quickly as by this compression of atmospheric air. If the vessel, for instance, is of 1,400 tons burthen, the hull is generally estimated to weigh as much. Seven and a half tons of quicksilver, moved at the rate of 220 feet per minute, is equal to 100 horses power. A horse power of an engine is estimated at 33,000 lbs. lifted one foot high per minute, and the force necessary to produce this (or an effect which is equivalent to it) is called the force of a horse. Thus 33,000 lbs. weight divided by the velocity will give, at all speeds, the comparative power. Lord D. considers that 150 lbs., moved at the rate of 220 feet per minute, is equivalent to the quantity before stated, moved one foot high. Seven and a half tons pressure of quicksilver, therefore, is equal to the effective power of a 100-horse engine, elevating 15,000 lbs. of water to the height of 220 feet; consequently 15 tons pressure would be required to perform the office of two 100-horse engines; to this add the quantity of quicksilver necessary, contained in the channels connecting the reservoirs, and the whole may be considered as 20 tons, which is proposed to be doubled in amount, in order to provide sufficient compressing power when the sea is comparatively smooth. These 40 tons will scarcely have a perceptible effect upon the motion of a vessel weighing and containing about 2,800 tons; and those who have seen the facility with which large vessels toss about the enormous weight they contain upon the face of the ocean, well know how rarely the requisite quantity of quicksilver will be moved from side to side, moderating, inasmuch as it can affect, the unpleasant and injurious vibration of the vessel; they will be perfectly persuaded, too, that an absence of rolling waves will not often occasion an absence of power.

Vessels filled with the quicksilver apparatus might be provided with sails of the usual kind. There would be no smoke nor any fire, and there need be no indication from their external appearance that they are equipped in any other manner than as sailing vessels.

The price of quicksilver is high, about

200*l.* per ton; but when it is considered that 14,000*l.* worth of coals are consumed by 200-horse engines in a twelvemonth, and that the whole quantity of quicksilver required to propel a vessel *for ever*, on Lord Dundonald's plan, would not cost more than the price of eight or nine months' coal, the gain will be seen to be immense. There could be no sensible diminution of the silver during any length of time, as the air contained in the cases would still continue to be confined.

Lord Dundonald calculates that a 38 gun frigate will give three double rolls and a half on a long swell in a minute—that is seven half rolls; but out of these seven half rolls he reckons on obtaining a hundred revolutions of the paddle, or, in fact, any other number desirable. For, though each roll can produce but one vacuum where there is but one compression, there may be any number of compressions employed, and any number of separate vacuums obtained. At the Royal Mint, where it is well known all the coin of the country is stamped by means of vacuum power, the number of strokes made by the great engine is only 20 per minute, while the small pneumatic engines which are actuated by it make 100. Lord Dundonald's apparatus would operate in precisely the same way. His lordship thinks that the quicksilver compressors should be of at least double the capacity of the engine.

C.

HOWARD'S QUICKSILVER ENGINE.

Sir,—I thought the absurdity of employing a medium for the transmission of heat to water for generating steam, or any other purpose, had long since been fully proved, both practically and theoretically. Mr. Howard, however, according to your correspondent V., seems to be of a different opinion. His plan, in principle, embraces those of Dr. Albans and M'Curdy, differing from Dr. Albans only in the medium employed, which was soft metal instead of quicksilver; but, like M'Curdy, he injects streams of water on heated surfaces. It is not my intention to enter into any argument to show the fallacy of the plan as detailed by V., but I will put a simple question or two to Mr. Howard, which must not be taken, however, as intended to render him a disservice; far from it, they may, on the contrary, possibly prove a benefit.

First, then, does mercury extract heat from the plate on which it rests, and beneath which the fire is applied, quicker than water, especially whilst maintaining a temperature far greater than water for either low or high steam? Supposing it, however, to possess this property, I ask, upon what principle can mercury, of only four or five hundred degrees, charge the plate above, on which the water is injected, twenty times faster than fire does when directly applied; for such must be the case, if, as I believe your correspondent states (for I have not the number of the Mech. Mag. by me), that three-fourths of a foot is sufficient for one horse power, and this, too, notwithstanding that the temperature of the plate is maintained much above what is required by the ordinary method of allowing a body of water of 220° for low, or 270° for high steam, to remain in constant contact? The reasoning upon which such conclusions are founded, as those contained in your correspondent's letter, is to me totally incomprehensible.

Without entering into the practical objections to the employment of mercury, or into the pretended saving of fuel, space, &c., I will content myself at present with putting the above questions, in the hope of receiving some further illustration of the plan.

A. SUTHRON.

REASON OF CATS ALIGHTING ON THEIR FEET IN FALLING.

"The fear with which they are seized makes them bend the spine of their back, so that their entrails are driven upwards, at the same time they stretch out the head and legs, which gives to these parts a greater action to raise themselves. Thus their centre of gravity comes to be different from the centre of figure, and placed above it, consequently they must make a half turn in the aid, and turn the legs downwards.

"The nicest knowledge of mechanics would not do better on this occasion than this confused and blind sense of fear does."—*Abridged from a paper, by M. Parent, "On the Centres of Conversion;" read before the Royal Academy of Sciences at Paris in the year* 1700.

"The instinct which all animals seem to

possess in bringing the line of the centre of pressure within the base is admirable. It is this instinct which renders the wild goat and chamois so fearless of danger in the terrific leaps they make among the Alpine precipices, and which enables a cat always to alight on its feet in falling from heights that appear sufficient to render a fall fatal. Now the operations of instinct, though, in many points of view, not a little miraculous, are always regulated by some ingenious principle, when that can be discovered; and, in the instance of the cat falling on her feet, it appears to me that the same principle operates which enables us to walk upright by regulating our centre of pressure, attending to the things around us. In learning to walk, we judge of the distance of objects which we approach by the eye, and by observing their perpendicularity, determine our own. Hence it is that no one who is hoodwinked can walk in a straight line for a hundred steps together; and, for the same reason, most people become dizzy when they look from the summit of a tower or battlement much raised above the object, in the sphere of distinct vision. A whirling wheel, or the current of a rapid river, or the apparent motion of the sea, on looking over the side of a fast sailing vessel, have often a similar effect. When a child can first stand erect on its legs, if you give his attention to a white handkerchief, extended like a sail, he will stand firm; but the instant you remove it he will tumble down. It is for this reason that rope-dancers, who have a very narrow base upon which to maintain the line of direction perpendicular, keep their eyes fixed upon a point of the framework upholding the rope, by which to regulate the centre of pressure."—Professor RENNIE.

"ZINCOGRAPHY" NOT NEW.

Sir,—Solomon said that that there was "nothing new under the sun." The numerous instances of "new inventions" being found to be old ones, adds weight to the axiom. Modern inventors may be more appropriately called "discoverers," and the field of their exploration, books, not the brain. The "ingenious Frenchman," whom, in your last week's Number, you state as having invented "zincography," may be put amongst this class of discoverers. In your own Magazine, vol. iii. p. 254, published eleven years ago, you will find the following paragraph:—

"ZINC PLATES FOR ENGRAVING.

"In Germany, artists have begun to substitute zinc plates instead of copper plates, and also instead of *stone for engravings. The artist draws on the zinc* as on stone, and the expense of engraving is saved. A large work, being a collection of monuments of architecture, from zinc plates, has already appeared at Darmstadt, and is highly spoken of. The process is said to unite the economy of lithography with the clearness of copper engraving."

You will thus see that there is nothing new in the thing but the name. If, therefore, it be really patented, the patent is good for nothing; and if Mr. Chapman has paid any thing for the right to manufacture it in England, his money has been thrown away.

So far from zincography superseding lithography, as it is said to be likely to do in the paragraph alluded to, we see, that after having had a fair trial, by the execution of a book of plates in this style, eleven years have passed away without its coming into use; from which it seems only fair to infer, that there must be some serious practical drawback to its supposed utility. The "ingenious" resuscitator of it has, at all events, acted rather disingenuously with the invention of his German neighbour.

The detection and exposure of such practices is a useful feature in your valuable publication.

I am, Sir, yours, &c.
W. A. R.

Oct. 8, 1834.

NOTES AND NOTICES.

The Halley Comet visible in America.—This comet, says the *New York Commercial Advertiser*, is now visible in the east, near the constellation Taurus. At this time its distance from the Earth is 40,000,000 of miles. On the 13th of September it will be only 22,000,000 of miles distant, and from this will become brilliant. In the latter part of September it will enter the Twins, and on the 1st of October will reach within 6,000,000 of miles of us, the fore-feet of the Great Bear, where it no more sets. At this its brilliance and apparent magnitude will have arrived at the highest degree. On the 6th of October it will stand nearest the Earth, only 3½ millions of miles distant. In the beginning of the year 1836 it will emerge from the Sun-beams, and again become visible at the distance of 40,000,000 of miles from us. It will, for the second time, approach the Earth, and on the 1st of March, 1836, will stand 25,000 000 of miles distant. It will then begin to recede from the Earth.

M. Agassiz.—We doubt whether, beyond a certain circle connected with geological investigations, the high merits of the modest philosopher of Neufchatel, M. Agassiz, be adequately understood and appreciated. Indefatigable and unrivalled in the pursuit to which he has principally devoted himself, the master of fossil ichthyology combines a thorough acquaintance with the other branches of the comprehensive service to which his disinterested labours supply one of the most important keys; nor is it possible to contemplate closely the mingled acuteness and simplicity which mark the character of M. Agassiz, without feeling an interest which attaches as much to the man as to the philosopher. This gentleman has been successful beyond his hopes during his brief visit to England, in extending his knowledge of fossil fish, having

discovered many new species and genera in the specimens of Oxford, and other places; but especially amongst those in the private collection of Sir Philip Egerton, at Oulton Park, in Cheshire.—*United Service Journal.*

M. Arago gave utterance to the following valuable truth, at the Edinburgh Grey dinner. In speaking of the junction of men of letters and of science, he said:—"I think I do not deceive myself as to the tendency of this happy union. It is the men of thought and study who in the long run govern the world. The grandest moral truths spring from their discoveries. It is their writings which render these truths fruitful, which popularise them, which make them penetrate the minds of the people at large, and impress upon them an indelible character of rectitude. The spirit of union among men of science is the certain presage of the union of nations."

M. Dalesme proposed (1706), in order to facilitate and augment the action of those who tow boats, to hang along a river side a rope, which the men may take in their hands as they tow the boat. He found, experimentally, that with this assistance there was almost half as little trouble. —R. W. D.

Surprising Swiftness in the Motion of an almost Invisible Insect.—M. Delisle has observed that a fly, so small as almost to be invisible, ran over a paper of almost 3 inches in half a second. It was so small that its feet might be reckoned to apply themselves successively upon the whole space that it ran over. And as it appeared to M. Delisle that they might be one-fourth of a line in bigness, it made in the space of a line 15 steps, or 15 motions, and, consequently, it made 540 in the space of 3 inches. How nimble must it be to remove one foot above 500 times in half a second, or more than 1,000 times in one of the common pulsations of our arteries!—*Ibid.*

Steam-Carriage in Belgium.—Antwerp, Sept. 28. —This day a trial was made with one of the locomotive machines which have just arrived in this country from England. It was perfectly successful. The carriage started at half-past eleven along the paved road from Antwerp to Brussels, and proceeded as far as Luytagen, where the company stopped for twenty-five minutes. At a quarter to one the carriage had returned to Antwerp, and was running round the Place de Meir. Notwithstanding this speed, we observed that on account of its being the first trial on our roads the carriage was not allowed to go with any thing like the velocity of which it is capable, and we are assured that in future it will be allowed to run even much faster! All along the road the spectators, astonished at a sight so new to them, saluted the steamer with cheers and acclamations. This new carriage does not only run with extraordinary velocity, but it stops and turns and winds about in every direction with astonishing facility. This was particularly remarked during the evolutions on the Place de Meir, amidst crowds of carriages, horsemen, and pedestrians. Many persons had previously thought that the steam-carriage would be the cause of accidents by causing alarm to horses. This objection is proved to be completely chimerical; it was purposely put to the test in every possible manner. Horses were made to approach it in various ways, and not one, at any time, showed any symptom of fear. Both going from and returning to Antwerp the steam-carriage drew another carriage after it full of passengers.—*From the Morning Herald.*—We believe the carriage here alluded to is that of Messrs. Squire and Macerone.

In the last volume of the "Saturday Magazine," there was an article on the invention of steam-navigation, in which the honour of this great discovery was ascribed to Henry Bell. The su claims of William Symington having been brought before the Committee of the Soci Promoting Christian Knowledge, under wh perintendence the "Saturday Magazine" lished, they have just published the followin handsome and satisfactory correction of the they had committed:—"We have recei pamphlet, entitled 'A Brief Narrative; p the Right of the late William Symington Engineer, to be considered the Inventor of Land-Carriage Locomotion, and also of Navigation.' From the statements of the Mr. Robert Bowie, and the documents produced, it is evident that Henry Bell himself of his knowledge of Mr. Symi plans, and of the unauthorised inspection models of his apparatus, in constructing th upon which his unfair claims to the inv were founded. Mr. John Kay, of Rochda also written under the impression that M was present when he, Mr. Kay, suggested t of working small boats by hand-machinery large vessels by steam-engines. Mr. Kay is ever, widely mistaken, as he states the co tion, to which he alludes, to have taken p Liverpool, in 1796 or 1797, and Mr. Syn had actually worked a boat by steam-mac in 1788."

Bronze Sheathing.—There has been del this week, at H. M. dock-yard, a quan bronze sheathing; and directions have been by the Lords of the Admiralty to sheathe the Falmouth packets that may next requi pering, one side with bronze and the othe copper, so that a comparison may be fairl blished of the duration of the two substances results of the experiments made in the navy on bronze sheathing, very imperfectly factured, as stated in the *Annales de Mariti* 1830, 31, and 32, go to prove, that when app ships' bottoms the loss in weight of the is less than half that of the copper. It has same time been found, in every instance, quite clean. Nearly the whole of the whale India ships from Havre are sheathed wi material.—*Plymouth Herald.*

The *Char-volant* which was brought out weeks ago at Paris, has come to a dead The *Athenæum* states, on the authority of a P correspondent, "that it was to have star Monday for the Champ de Mars, and had sails set, but no progress was made, althou wind was very favourable. Several men at one time employed to aid its progress, result was such as to convince even the in that the plan was a total failure."

Mr. Baddeley on Barton's Piston in our

Pit—much obliged for his suggestion. favour us with Mr. S.'s address?

Communications received from Fly W Mr. Bowser—Anti-Dandy—A. B. (Templem T. G.—The Genius of Mechanical Philosoph

The Supplement to the present Volume Contents, Titles, and Index, and Portrait, o of the late Mr. Telford, will be published 1st of November.

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PROFESSOR HARE'S APPARATUS FOR MAKING ICE.

PROFESSOR HARE'S APPARATUS FOR MAKING ICE.

(From the Journal of the College of Pharmacy, Philadelphia.)

The congelation of water by its own vaporization, accelerated by exposure to the absorbing power of sulphuric acid, or other agents in vacuo, has always been a difficult experiment. A distinguished professor complained to me lately of want of success in his efforts to repeat it. In November, 1832, after having three times succeeded in freezing water by the process in question, yet having failed before my class, I was led to give more than usual attention to the process, in order to obviate the causes of disappointment. It appeared to me that the failure arose from imperfections in the vacuum. An excellent pump, with perfectly air-tight cocks, is indispensable; and not only must the pump be well made, it must likewise be in good order. Neither should the packing of the pistons, the valves, nor the cocks, allow the slightest leakage. If a pump has been used previously for freezing, by the evaporization of ether, it will not be competent for the experiment in question, unless it be taken apart and cleaned.

Cocks of the ordinary construction are rarely, if ever, perfectly air-tight, and their imperfection always increases with wear. Under these impressions, having cleansed my air pump, and put it into the best order possible, for the purpose of obviating leakage through the cocks associated with the instrument, I closed the hole in the centre of the air-pump plate by a screw, and for a receiver made use of a bell glass, with a perforated neck, furnished with a brass cap, and a female screw, by means of which one of my valve cocks was attached. A communication between the bell and the chambers of my pump, was established through the valve cock and a flexible lead pipe, in a mode analogous to that described in the account of the valve cock, "Journ. Frank. Inst." vol. xi. p. 293.* In this way I succeeded in preserving the vacuum, longer than when the cocks of the air-pump were employed in the process; and accomplished the congelation of water by means of the vacuum and sul acid.

Latterly, I have used an app which is represented by the pr figure, in which a brass cover is m close a large glass jar, so as to be tight. In operating, the bottom jar was covered with sulphuric aci another jar with feet, also supplie acid enough to make a stratum h inch deep on the bottom, was intro as represented. The bottom of th sel last mentioned was, by means feet, kept at such a height abo surface of the acid in the outer j not to touch it. Upon the surf the glass vessel a small piece o thin sheet brass was placed, made cave in the middle, so as to hold a quantity of water.

The brass cover was furnished three valve cocks, one communi with the air-pump, another with a meter gauge, and the third with a nel supplied with water. Under circumstances, having made a va on a Saturday, I was enabled to water situated on the brass, and t up the congelation till the Thu following. As water in the state evaporates, nearly as fast as when the whole quantity frozen would entirely disappeared during the but for the assistance of a watc whom I engaged to supply water tervals. At a maximum I suppo mass of ice was at times abou inches square, and from a quar half an inch thick. The gradual duction of the water, by aid of th nel and valve cock, also of the represented in the figure, by wh was conducted to the cavity in the brass, enabled me to accumulate a larger mass than I could have pro otherwise. The brass band whic braces the inner jaw near the brim, the three straps proceeding fro serves to keep this jar in a prope sition; that is, in fact, concentric the outer jar.

In this last-mentioned experim employed an air-pump upon a new struction, which I have lately cont and of which I shall soon publ description.

* *Mech. Mag.* vol. xix. p. 402.

Fig. 1.

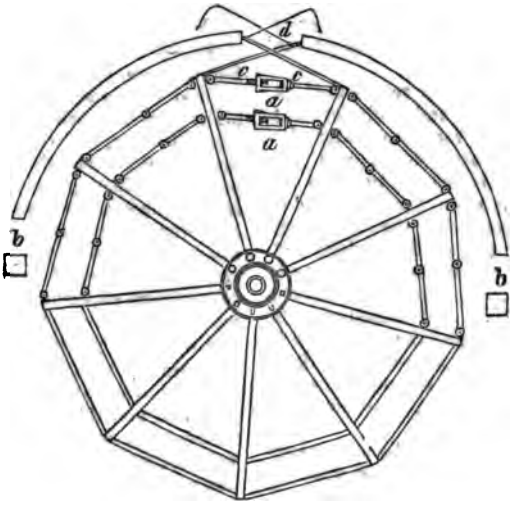
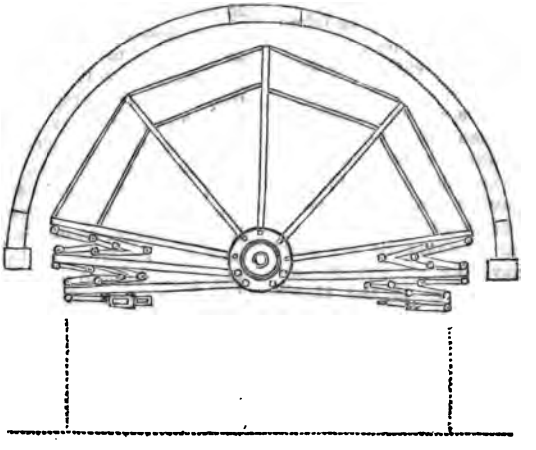


Fig. 2.



SHIFTING PADDLE-WHEEL.

Sir,—I send you the accompanying plan and description of a paddle wheel for insertion in your Magazine. The intention of it is to facilitate the withdrawal, and to remove entirely the wheel from the vessel in a few minutes. It has generally been admired for its simplicity; but *from my not having means to produce it on a large scale, I take this opportunity of laying it before* the public, imagining that in some cases it will be conducive to the general good.

The wheel is nearly similar to the ordinary one, with the exception of one segment of the boss being so constructed as to allow the radii arms there inserted to revolve on circular bolts, as may be seen in the upper part of fig. 1; and those revolving radii are connected by jointed rims, which are of course flexi

ble. The two upper radii may be separated by unscrewing the two shackle screws *a a*, which are for the purpose of bringing the moveable segment of the wheel tightly together.

Now as the wheel is represented in fig. 1, it is connected and ready for use; and to remove it from the water the screws *a a* are eased down, and the weight of the divided segments is allowed to come upon the tackles *c c*, which are attached to the two upper radii, and the top of the paddle box through the two scuttles *d*. They are then lowered down upon the standing part of the wheel, and lashed thereto with chains through the scuttles *b b*. The paddle is then caused to make a demi-revolution, and is entirely withdrawn from the water, assuming the position of fig. 2.

I will now enumerate the advantages which I think would be derived from my invention.

First, should a vessel be running along a lee-shore, and an accident happen to her machinery, which renders it useless, the paddles could *entirely* be taken off the vessel in a few minutes, and she would be placed under canvass to keep her off the shore.

Secondly, should a steam-vessel be on a long voyage when the fuel must be economised, it would be easy to take advantage of every favourable breeze; or in running down a trade to consume no fuel for days together.

And, thirdly, it would be of great benefit to remove the paddles in case of exposure to ice, as in the Dutch or Russian steam-vessels, which have to encounter the destructive effects of the broken ice when the thaw commences. Or should a steam-vessel be again wanted for another Polar expedition, what an advantage it would be to her to be capable of immediately withdrawing her paddles, in case of being suddenly surrounded with ice, or again quickly applying them on meeting with clear water.

I have constructed a model with the flexible rims formed of crank chain, but which I have been advised to lay aside in favour of my original plan of jointed bars. Trusting it may be approved of,

HENRY CUNNINGHAM.

Cold Harbour, Gosport
Sept. 15, 1834.

ON THE PROPULSION OF VESSELS BY THE PROJECTION OF WATER FROM THE STERN.

Sir,—The idea of propelling vessels by forcing water out of the stern is a very natural one, and has occurred to very many persons; scientific and practical men, however, are well acquainted with the difficulty—nay, the impossibility, of profitably effecting the propulsion of vessels by plungers or pistons. Those persons who have made the attempt were unacquainted with the law which governs the motion of fluids, or lost sight of it in their experiments, otherwise they would never have thrown away their time and money in pursuit of the chimera.

There can be no doubt, if we were to force an adequate volume of water with *sufficient velocity*, that the object would be attained, so far as effect goes; that velocity, however, cannot be produced but at such an expense of power as destroys all chance of profitable application.

Supposing the diameter of a paddle-wheel to be 18 feet, and that it makes 25 revolutions in a minute, the velocity of the paddles will be $18 \times 3 = 54 \times 25 = 1350$ feet per minute, nearly 15 miles per hour, which it is necessary to maintain to ensure a proper speed to the vessel. Now, sir, it is perfectly impracticable to work plungers at the rate of 1350 feet per minute, consequently the area of the working barrel or cylinder must be increased above that of the delivery passage, as much as the required velocity exceeds that at which the plungers ought to work. Suppose, then, the required velocity of 1350 feet to exceed the working velocity of the plungers ten times, it follows that the working barrel or cylinder must be ten times the area. It is a well-known fact, that water discharged through an orifice, at any certain velocity, cannot be increased to double such velocity, unless the head be increased to four times its height; in other words, unless the head be increased as the square of the velocity, consequently it requires four times the power to produce twice, nine times the power to produce thrice the velocity, and so on.

Thus, as velocities can only be obtained at an expense of power increasing as the square, it follows that the power (the area of the cylinder being to that of the delivery passage as ten is to one) will be

to the effect as *one hundred to one ;* whilst the difference between power and effect by the paddle-wheel will be only as four and a half to one, for the leverage of the wheel is nine feet, four and a half times that of the crank, supposing a four feet stroke; hence it is $4\frac{1}{2} \div 100 = 22$, or twenty-two to one in favour of the paddle wheel. One-third of this, however, must be deducted, as the crank is not an equable and efficient lever during a revolution. We may conclude, therefore, that the paddle wheel is as fourteen is to one, superior to the plunger plan ; or the plunger plan will require fourteen times more power to produce the same effect as the wheel.

The spiral or screw seems to offer the most simple means of effecting the purpose ; no power would be lost, as compared with the paddle wheel; but then we have to attain a high velocity, which is a difficulty, and to the absence of which, I have no doubt, must be attributed the failure of all the attempts that have been made with it.

We see, by the foregoing, that we must acquire a velocity of 1350 per minute ; supposing, then, the average pitch of the spiral, or distance between the threads of the screw, to be three feet, it would be necessary, in order to pass through a cylinder of water 1350 feet in length, that the spiral should make $3 \div 1350 = 450$ revolutions, which is eighteen times the number of revolutions made by the crank-shaft in a minute, consequently the speed must be reached by gearing, and this is objectionable in a steam-boat.

Were such machinery, however, snugly arranged, and its proportions judiciously designed, it would be far less objectionable than would at first sight appear. A screw enveloped in water would not be subject to shocks like a paddle wheel, which is now buried in a sea, and the engine brought nearly to a stand still, and the next moment flying in the air; but it would always feel an equable resistance ; hence the gear would not be liable to those sudden strains, which with paddle-wheels is inevitable.

The velocity required by the screw is certainly high, but in other respects it would effect every object that it is desirable *to attain ; it would be* as simple as the paddle-wheel, and less injurious, I believe, to a vessel ; it would be out of the way of shot, and other dangers; feel no ill effects from bad weather, but continue effective amid the raging of the elements, in a far superior degree than it is possible for a paddle wheel to maintain ; and, finally, would restore the vessels to their former sightly trim. And this, with the means possessed of making simple and effective boilers that would not take up more than one-third of the room occupied by an ordinary one, and capable of being repaired at sea without the least d ifficulty, and with little loss of time, would render a steam-boat something like what is so much desired. Nothing, however, is so difficult as to get new plans substituted for old, however palpable the advantage.

I am, &c.,

A. S.

P. S.—I hear the Messrs. Maudsleys have built a steam-carriage; but it has proved an incurable failure, its weight is enormous—five tons.

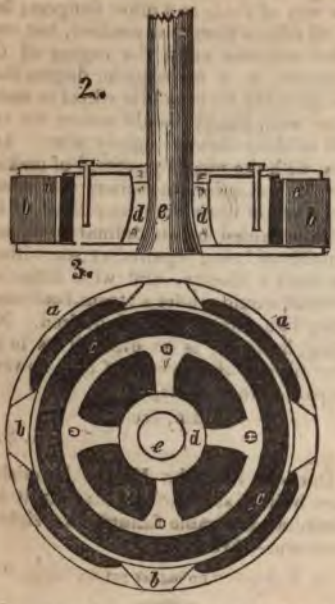
Oh, Hancock, "up higher yet thy bonnet."

BARTON'S IMPROVED METALLIC PISTONS.

Sir,—I beg to return my grateful thanks to your correspondent, Mr. J. R. White, for his information relative to Mr. Barton's metallic piston, at page 447, vol. xxi. I have been unable to see the work alluded to, but on referring to the new series of the "Register of Arts," vol. iii., I have found the following description, which, in justice to Mr. Barton, I subjoin :—

"Fig. 1 represents a plan of Mr. Barton's improved piston, with the top plate

removed; fig. 2 a vertical section of the



same, taken in a line with *b*, *c*, *d*, in the plan. *a*, *a*, *a*, *a*, are the four metal segments; *b*, *b*, *b*, *b*, four right-angled wedges interposed between the segments, their points forming a portion of the periphery of the circle; *c*, *c*, *c*, *c*, is a thin steel spring, formed of a single broad hoop, and pressed into the undulated form represented, by which it is found to act with uniform energy upon the wedges, until they and the segments become so much worn in the course of time, that the steel spring recovers itself into its original circular figure; *d* is the framework, cast in one piece with the lower plate of the piston; *e* is the piston-rod: the dark spaces shown on the plan within the circular frame *d*, are cavities to lessen the weight of the metal; the other dark spaces are cavities to allow of the free action of the circular spring.

"To prevent the segments from falling out of their places whilst the piston is being taken out, or put into the cylinder, the periphery of it is grooved near to its upper and lower edges, in which are sunk two light spring hoops, cleft across into *a forked joint*; to lubricate the piston, there is a third groove made between the two former, for the reception of oil; these parts are not introduced into the figures.

"The action is as follows:—As the piston and cylinder wear away by the friction, the circular spring *c* presses out the wedges *b*, and these project the segments against the cylinder; by degrees they are reduced to the dimensions of that exhibited in fig. 3, which is an exact representation of one we saw taken out of a cylinder, in which it had been constantly working (without repairs) for several years.

"Neither the cylinder nor piston were in the least degree grooved or scored; but had both retained their circular figure, and were highly polished on their rubbing surfaces: we say this, as the contrary has been stated, to Mr. Barton's disadvantage.

"The 'Repertory of Arts' contained a statement of this kind from Dr. Gregory, the eminent professor of mathematics at Woolwich, which Mr. Barton answered by having his pistons drawn out from the cylinders of an engine in Woolwich dock-yard, and shown to Dr. Gregory.

"It is certainly easily demonstrated, that the wedges move faster than the segments, and that consequently the pressure upon the wedges is greater than that on the segments; in a right-angled wedge this difference is as 2 to 1, but the wearing is in no such proportion, nor is there *in practice* any perceptible difference at all; which arises, we conjecture, from the following cause. The cylinder being of cast-iron, and the piston of a much softer and easier abraded metal (an alloy of copper), the only effect of the superior pressure of the wedges is to wear them away quicker than the segments, while the wearing of the cylinder, from its superior hardness, is scarcely perceptible. In consequence of this arrangement the brass piston will always conform itself to the circular figure of the cylinder, until worn out."

By comparing this account with my description of Heaton's piston, at page 134 of your last volume, your readers will at once perceive the points in which they agree, and also in which they differ:

the principal difference is, that Mr. Barton employs a flexible ring, while the Messrs. Heaton retain the spiral springs, which I consider preferable, as affording a larger range of motion. However, as both pistons are now fairly before your readers, they can form their own opinions of the respective merits of each.

When I wrote the description of Messrs. Heaton's piston, I was ignorant of Mr. Barton's improved mode of construction, as explained in the foregoing extract; and had he referred me to this description, instead of unwisely attempting to establish the perfect identity of the two pistons, he should have had no grounds for complaining of unfairness. I consider, therefore, that Mr. Barton has only himself to blame for what occurred in consequence of the injudicious line of argument he thought proper to employ. I am, Sir,

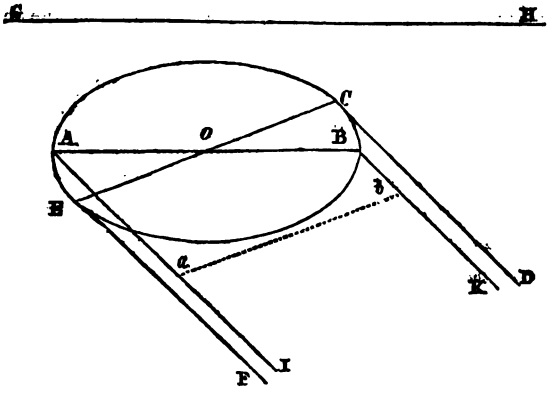
Very respectfully yours,
WM. BADDELEY.

Oct. 6, 1834.

ISOMETRICAL PERSPECTIVE.

Sir,—I am glad to perceive an evident improvement in the knowledge of isometrical perspective by your engraver. I beg, however, to say, although the longest diameter of the elliptical table in the centre of the Royal Kitchen is indeed parallel to the side of the room, to have that appearance in the isometrical representation it must not be so. Evidently by not understanding this your engraver has given the steam-table a wrong representation.

Conceiving that explanation of errors when they occur is the best method of giving instruction, I venture to explain in what direction the longest diameter of the representation of the elliptical table ought to have been in order to appear correct.



Suppose the elliptical line in the diagram to be the shape of the table, A B is its longest diameter, and the parallel right lines C D and E F is the direction in which it is to be viewed in the representation. From this it will be seen that the line E C will be the longest diameter in the representation, while A B, which will still continue to be parallel to G H on the side of the room, will not appear in proportion longer than *a b*, for the rays A I and B K are parallel to C D and E F; therefore, the direction of the longest diameter E C of the re-

presentation ought to make an angle A O E with the original longest diameter A B.

I need only add, that if there had been a greater distinction in the shades of the different surfaces, the appearance would have been much improved, some being too dark, and others not sufficiently so.

I am, Sir, yours obediently,

JOSEPH JOPLING.

Oct. 13, 1834.

HOWARD'S VAPOUR-ENGINE.

Sir,—Allow me to point out the impropriety of your correspondent's denominating my vapour or steam-engine a "quicksilver-engine," which would lead to the supposition that its power or motion is derived from some physical property of mercury. The efficiency of the invention as applied to navigation being in the course of trial, I consider it premature to enter into the subject further at present than merely to observe, that A. Suthron has mistaken the principle of that portion of it on which the vaporisation is founded. As he has done me the honour (on what ground I know not) to allude to a *pretended* saving of space, fuel, &c., he will surely be content to wait until the result, whatever it may be, of the present experiment shall afford him *practically* "some further illustration of the plan."

I am, Sir,

Your obedient servant,

THOMAS HOWARD.

London, October 14, 1834.

SOLUTION OF THE PRACTICAL RAILWAY QUESTION, PAGE 432, VOL. XX. BY KINCLAVEN (THE PROPOSER).

Quest.—Suppose a carriage to move from a state of rest by the force of gravity down a regular inclined railway, the declination being one in 80; suppose that at the end of 12 seconds the distance gone over is 18 feet; and that at the end of 200 seconds, counting from the time of starting, the whole distance descended is 4,800 feet. It is required to determine, 1. How much of the velocity is destroyed by friction per second? 2. The whole amount of the resistance of the atmosphere? 3. How much of the velocity is destroyed by the joint operation of both causes? 4. The last acquired velocity? And 5. What part of the time of descent is lost through the resistance of the atmosphere?

Again: suppose that at the bottom of the plane another plane of the same inclination is to be ascended with the last acquired velocity, and that the friction and resistance of the atmosphere are the same as in the case of the first plane: required, to determine the distance to which the carriage will have ascended when it comes to a stand still?

Or, supposing that at the bottom of the first plane the carriage were to move forward on a horizontal plane, what distance would it reach?

In all the three cases, let it be assumed that the resistance to motion produced by friction is in proportion to the times—which is well known to be consistent with the actual fact.

Solution.

The resistance of the atmosphere on the first 18 feet, in 12 seconds, may be rejected: we shall, therefore, inquire what the value of g will be in the general equation, $S = \frac{1}{2} g t^2 \sin. i$. Supposing there were no resistances, either from friction or the air, so as to produce the effect stated in the question. From the equation we have $g = \frac{2S}{t^2 \sin. i} = \frac{36 \times 80}{144}$ $= 20$ feet. That is, if there were no resistances, and the force of gravity 20 feet, the carriage would descend 18 feet, from a state of rest, in 12 seconds: but the force of gravity is $32\frac{1}{6}$ feet, $\therefore 32\frac{1}{6} - 20 = 12\frac{1}{6}$ feet, $\therefore 12\frac{1}{6}$ is the resistance due alone to friction, in terms of gravity. Again, the value of g on the whole distance is $\frac{9600 \times 80}{4000} = 19\frac{1}{5}$ $\therefore 32\frac{1}{6} - 19\frac{1}{5}$ $= 12\frac{23}{30}$ feet is the sum of the resistance due to friction and the atmosphere, $\therefore 12\frac{23}{30} - 12\frac{1}{6} = \frac{4}{5}$ of a foot, is the mean resistance due to the atmosphere, in terms of gravity; or the resistance of friction is to the mean resistance of the

air as $12\frac{1}{5} : \frac{4}{5}$, or as 365 to 24. Again, by supposing $g=20$, the time of descent will be $t = \sqrt{\left(\frac{2S}{g \sin. i}\right)} = \sqrt{\left(\frac{9600 \times 80}{20}\right)}$ $= 195{\cdot}96$ seconds; or the resistance of the air retards the time of descent by (200—195·96) 4·04 seconds. And again, by supposing the resistance of the air to be equally diffused over the line of descent, on that supposition the last acquired velocity would be $v = g\,t \sin. i = \frac{19\frac{1}{5} \times 200}{80} = 48$ feet per second. But this velocity is somewhat too great, for the following reason: Conceive two carriages to start at the same instant, as in the question, the one urged on by a force (similar to gravity) of $19\frac{1}{5}$ feet, and the other by a like force of 20; but that the second has to encounter the variable resistance of the air, the second carriage will take the lead of the first during the whole descent; but just as the second reaches the bottom it will be overtaken by the first, consequently the velocity of the first carriage, at that instant, will be greater than that of the second. Further, if we calculate the last acquired velocity to the time 195·96 seconds, and taking the value of $g=19\frac{1}{5}$, then $v = \frac{19\frac{1}{5} \times 195.96}{80}$ $= 47.03$, and this velocity is evidently too little; hence $\frac{1}{2}(48+47.03) = 47.51$ feet will be a very near approximation to the last acquired velocity.

Had there been no resistances,

then $v = g\,t \sin i = \frac{32\frac{1}{6} \times 200}{80} = 80.4166$

Calculated value of v, including resistances $\Big\}$ 47.51

32.9066

Hence $32.9066 \div 200 = .164533$ feet will be the velocity lost per second, in consequence of the joint resistances produced by the uniform resistance of friction and the maximum resistance of the air. Moreover, the last acquired velocity, abstracting *from* the resistance of the air, is $v = \frac{20 \times 200}{80} = 50$. Hence $(80.4166 - 50) \div 200 = .152083$ feet is the resistance per second, arising from friction, and .164533—.152083=.01245; or, the uniform resistance of friction per second is to the *maximum resistance* of the air as .152083 : 01245, or as $12\frac{1}{5}$ is to 1.

On the ascent the carriage has to encounter the combined resistances of gravity, friction, and the air; or, $32\frac{1}{6} + 12\frac{2}{3\frac{1}{5}} = 45\frac{2}{1\frac{1}{5}} = g$; so that the whole space ascended, when the carriage comes to a stand still, will be $S = \frac{v^2}{2g \sin. i} = \frac{(47.51)^2 \times 80}{90\frac{2}{1\frac{1}{5}}} = 2003$ feet, and the time of ascent will be $t = \frac{2S}{v} = \frac{4006}{47.51} = 84\frac{1}{3}$ seconds.

Lastly, the whole distance run on the horizontal plane will be $S = \frac{v^2}{2R}$,* where R is the resistance to motion per second, $= .164533$ $\therefore S = \frac{(47.51)^2}{.329066} = 6859$ feet, and $t = \frac{V}{R} = \frac{47.51}{.164533} = 288\frac{3}{4}$ seconds, and the mean velocity of the carriage, per hour, from the time of starting until the motion ceases, either when she has to ascend the plane, or go forward on the horizontal plane, will be $16\frac{1}{3}$ miles per hour.

KINCLAVEN.

P. S.—I have also solved the above question, on the supposition that the resistance of the atmosphere increases with the squares of the velocities, and the results are nearly the same as those found above.

THE EARL OF DUNDONALD'S NEW DISCOVERY.

"Lang life to the wilie loon that gangs a-field wi' a toom poke at his lunzie, and comes hame wi' a sack fu' o' siller."—*Humphry Clinker.*

"In chemistry and in mechanics quacked,
* * * * * *
And with invincible assurance backed."

Sir,—When Mr. Babbage lamented over the not quite proven "decline of science" in England, he forgot to advert to a much more serious evil—the mode in which "practical science" is beset upon every new conception by a host of quacks and projectors, abounding

* See page 216, vol. ii., of Dr. Gregory's edition of the Woolwich Course.

in ignorance and impudence, and devoid of all knowledge, save a conviction of the weakness of human nature—till she is delivered of a living or still-born burden, by some honest practitioner of sound understanding. The quacks and projectors have no especial love for science, and care nothing whether they may happen to godfather the true or the false; all they care about is to "make a sensation," and turn that sensation into the current coin of the realm at the expense of a gulled public, whom, from time immemorial, they have been accustomed to consider their "oyster." It was the case with steam-engines till Mr. Watt solved the problem in an effective form. Steam-boats then became the riding pad of the projectors; but when steam-boats became naturalised or artificialised to the ocean, and a *bona-fide* investment for capital, the projectors abandoned them. They then took to railroads and locomotives; but success dissipated mystery, and railroads no longer served their turn. Common-road steamers are now a fruitful source of projection, and serve these gentry as a sort of philosopher's stone. The time is fast coming, when common-road steamers will cease to be objects of wonder, and then the projectors will seek other modes of playing upon human credulity. There are more than one already in embryo, with all the necessary accompaniments of mysterious jargon and abstruse calculation, quite as satisfactory as the "unknown tongues."

I perceive, in No. 583 of your Magazine, a paper on "the Earl of Dundonald's New Motive Power." Query—Is his lordship active or passive in the matter? Judging by the signature, and the style of the article, I presume that it is his lordship's own production; and I will venture to make a few remarks upon it, in the hope that he will favour your readers with a more specific account of the machinery by which he purposes to enact the wonders of "the new principle which unfolded itself to him," like a roll in the Patent-office, worked by steam.

So far, then, as I can gather his meaning, he purposes to gather the power of the ocean waves on which the vessel floats, *i. e.* to gather their *gravity* above the surface level, and lodge it in sundry *tons of quicksilver*, which quicksilver is to be provided with a covered playground, and two holes for pitch and toss, with loose covers laid upon air-bags or boxes. From the quicksilver the *gravity* is to be given or transmitted to the air, and thence, by some unexplained process, it is to operate—I suppose—upon paddle wheels, and thus propel the vessel. If this be what he proposes doing, it would seem something of the same nature as the proposition to work paddles by sails—before the wind the vessel would move rather slower with the paddles than without them, and against the wind it would make no way at all, but drift bodily to leeward. His lordship sets out with a fallacy. He assumes that power resides in the "deranged equilibrium of a heavy fluid." It is true—but it is also true that that power is a borrowed power, borrowed from the wind, which has first borrowed it from *heat*. Now it is clear that a "deranged equilibrium" in the ocean surface—sufficiently deranged for his deranged purpose—must be produced by the wind; without wind the derangement would disappear, and having wind, it is better to use it at first hand, than through the secondary medium of the waves, with the disadvantage of added friction. The object which his lordship aims at must, of course, be a *constant* and *certain* power, instead of an inconstant and uncertain one like the wind. For this object his proposition is worth nothing. He may indeed allege that he wishes to take advantage of the long rolling swell which occurs after a calm. He may take advantage of it, but only in the direction which the wind originally gave it. In the teeth of the swell he could not advance one inch. The process passing in his lordship's mind would seem to be this:—A tidal power is a horizontal water power, which is applied to turn water wheels of mills. A *waveal* power is a vertical water power, which, if it can be converted to a horizontal power, may be applied to turn paddle-wheels of ships. This is all straightforward; it is the power of gravity in both cases, and may be applied; but his lordship forgets that the mill is anchored:—heave in the anchors, and the mill will move bodily in the direction of the stream, and the water-wheels will cease to act. Anchor the ship, and the paddle-wheels may be made

ut the ship will not move. His does not say how he proposes his quicksilver truck and com— how he means to hang his m—whether stem and stern, or ship. The "firm persuasions" dship are not sufficient vouchers his. Does he purpose making ls as long as the Irresistible and ance, and other Greek boats, in get as long strokes as possible e "three rolls and a half per n the long swell." The effi- the plan of extracting power course, depend on the vessel's on a central point, elevating stem alternately; athwart ships the ould not be sufficient to give a f stroke. But twenty tons of er, moving at the rate of 220 minute, may, it is said, be to forty tons!!! This is not rce, like steam, light and ma-, but pure gravity. What a tilt hammer it would make! hip will scarcely persuade people ght thousand pounds worth of er into iron boxes till he has g better to offer. In such a of gravity *versus* elasticity, the ill carry it hollow. The accu- is lordship's notions with regard es," may be gathered from the sentence:—

se who have seen the facility ich large vessels toss about the s weight they contain upon the he ocean, well know," &c.

his lordship must have perused rsair" till he has fairly persuaded that a vessel is actually "a thing containing motive power within ulk, and that the commonly re- otions of vessels being passive tions, acted upon by the waves, ar errors without foundation. I ten heard, and sometimes seen, cility" wherewith those who go the sea in ships as their com- "toss about" the cargoes which ssels may contain; but if the themselves take to "tossing argoes as the sea and its boister- ains do, fearful, indeed, will be to those who embark on the wide There is another curious pas-

sels *filled with the quicksilver s, might be provided* with sails of the usual kind. There would be no smoke nor any fire, and there need be no indication, from their external appearance, that they are equipped in any other manner than as sailing vessels."

If the vessels are to be "*filled* with the quicksilver apparatus," where does his lordship propose to stow the men and provisions? Are they to be carried "upon deck," or to be stowed amongst the "sails of the usual kind?" His lordship evidently has in contemplation a second edition of the *Rising Star*. His liking for an ocean incognito is clearly as strong as ever. He cannot be satisfied to have a vessel looking like what she really is—she must be one thing and seem another—be provided with extraordinary powers of fighting and manœuvring, yet look quite harmless—a kind of pick-pocket ship, bearing a respectable appearance till she can get "travellers by water" into her clutches. Supposing this practicable in the mode his lordship states, there would be something exceedingly cowardly in it. It might be a fitting implement for a pirate chief, or a sea thief-catcher, but not an honourable national weapon, fit for the needful warfare of open day. But the statement is incorrect. No vessel provided with paddle-wheels of any efficiency could be made to resemble a mere sailing vessel. The experiment has been tried in the case of the *Rising Star* and the *London Engineer*. It has been generally understood that it was to his lordship the "new principle unfolded itself" of putting paddle-wheels in two square holes in a ship's bottom, flush with the planking, and then expecting to get locomotion out of them. They did what they could; they churned the square holes full of water, and then made so much froth that some innocent spectators thought it was a new contrivance for making butter out of sea-water, thus to help the crew to "small stores" at a cheap rate. "She won't move on account of back-water," said his lordship. "Keep down the water to the level of the paddle blades, and she'll be an ocean wonder." Huge were the air-pumps set to work to force down the surface in the "Jerusalem fine"-wrought iron-tight-paddle cases, through which the axis worked in stuffing boxes, and fierce was the struggle between wind and water,—but it was "no go"—at

least no go forward; the paddles in anger whipped the sea into a syllabub, while "the vessel, in its external appearance" was like any other vessel at anchor; but the syllabub, or silly bubble, subsided, and there was an end of it for some years, the vessel being laid up in ordinary to recover herself, as poor genteel men do by their old coats—put them by to grow new again, or till their neighbours have partly forgotten them. Some years after the *Rising Star* SAILED for Chile—the whole being at the expense of the poor Chilenos. His lordship tried, during a day and a half, to coax her a distance of eighteen miles, and she churned the Pacific Ocean magnificently; but it was all show and no progress, like a managed horse, which, as the jockeys say, "will gallop for half an hour on a cabbage leaf." And then, just as the difficulties were all got over, an unlucky screw got loose in the paddle-box, and there were no means extant in the Pacific to repair the damage. Consequently the Rising Star was anchored in Valparaiso Bay, and made a beautiful tender for convicts, till one unlucky day a northerly gale disturbed her, and she took it so to heart that she expired on the beach, and her machinery taking a new character, enacted the part of "old iron."

At a subsequent period, his lordship tried his hand on the Greek boats. He had got fast hold of the principle, that moving bodies in water diminish their friction in proportion as their length exceeds their breadth; but he had forgotten the other principle, that the breadth of a floating body must be ample in proportion to its height and length, or it will "capsize." He subsequently found out this truth, but it cost the poor Greeks some money. It is to be hoped that his lordship will verify his quicksilver plan at his own expense, and not be employed by Government to do it at John Bull's cost. If it should fail, the quicksilver may serve to extract dead silver in the mines of Peru. The idea of "propelling a vessel *for ever*" is certainly fascinating, and, if successful, will beat the Flying Dutchman off the face of the salt water. She has hitherto possessed the exclusive right of navigating the ocean "in the wind's eye" in all weathers; *but this will be nothing to the hosts of "vessels filled with* the quicksilver apparatus," and doubtless bringing in silver quickly. How the mariners will pace the decks in peaceful leisure, looking out for the "three rolls and a half on a long swell!" No more whistling for wind! I would wish to offer to his lordship "a new principle, which has just unfolded itself," and which may perhaps be made serviceable during the short intervals of dead calm, when the quicksilver may be "inoperative." We know that while mariners pace a deck a considerable quantity of motion is generated; we know also that this motion is power. Suppose, then, that some arrangement were made to take advantage of this power, and apply it to the paddle-wheels. Motion thus taken advantage of may be applied "by the ordinary and well-known means" used at Brixton and various other houses of correction. I would submit also, that this power may be considerably increased and condensed by the well-managed introduction of a fiddler. It is lamentable to think how much voluntary power is wasted and thrown away, for want of a little pains in giving it a right direction.

The last sentence in the article states that "his lordship thinks." This is evidently a mistake; his lordship goes through no such tedious process. He arrives at his results by that quick method which the contemners of inspired genius call "jumping at conclusions."

I remain, Sir,

Yours very truly,

JUNIUS REDIVIVUS.

Oct. 13, 1834.

P. S.—I have read, with much interest, Mr. Baddeley's shrewd remarks on the various substances used for paper. It is clear, from his letter, that all the substances fit for paper-making are already used, if not precluded by the expense of preparation. But it is not so clear that knowledge has yet done all it can towards that preparation. It is clear that all fibrous vegetable matter may be converted into paper. But fibrous vegetable matter differs in its chemical as well as mechanical composition, and therefore the same processes cannot be available for all kinds. Mr. Baddeley would render a national service by analysing this point.

KYAN'S CURE FOR THE DRY ROT.
IN MURRAY, ESQ., LECTURER ON
STRY.

---

ing are the Letters in the *Times*, to
e present communication of Mr. Murray

" To the Editor of the Times.

s there is little doubt that the British
t will adopt Kyan's proposal for thepre-
dry rot, by the application of corro-
ate, it becomes a question of the most
portance how far the health of the offi-
ews of his Majesty's navy will be af-
t. That it may prevent dry rot, I do
to deny, but that it will destroy the
ose on board seems certain. It may be
ry corrosive sublimate will not rise in
ommon temperatures, but when in con-
oisture at an elevated temperature, and
electric atmosphere, it is evident to me
t mingle with the circumjacent air; and
t dispute the finite extent of evapora-
uestionably the muriate of mercury will
osed by the sulphuretted hydrogen of
vater, and form sulphuret of mercury;
aided by a tropical temperature, and
d, it can no longer, as muriate of mer-
the progress of dry rot.

ald be observed that iron or steel, in
ill also decompose this salt, and reduce
les of running mercury; and a variety
eans will accomplish its decomposition,
ick-lime, potassa, &c. Insect life may,
is contact with it, impregnate every de-
f food with a virulent poison; and if the
e be impregnated with mercurial effu-
nly will it be absorbed by respiration
ticular surface, but animal and vegetable
s used as food will also be inoculated
nd in tropical countries especially, these
be as injurious to human health, as the
r mines of Idria or Almaden. No one
ttempted to prove that sulphuret of mer-
remain fixed; and mercury at common
res, it is notorious, will vaporise and
e the atmosphere. In 1826, in a com-
n to the Admiralty, I submitted a plan
t dry rot, by impregnating wood with a
f green sulphate of iron. This was ef-
enclosing the timber in an air-tight case,
ming ship timbers, and allowing steam
space: a vacuum was formed by the in-
of a jet of cold water; when, by open-
mmunication with a tank supplied with
f copperas, it ascended and impregnated
, and by the subsequent introduction of
e liquid recovered its level in the tank.
r was then dried at a high temperature.
e two species of vegetation connected
dry rot, the *merulius destructor*, and
lacrymans, the difficulty combined with
on is, whether they are to be considered
ring of the dry rot or the cause; cer-
ey are its invariable accompaniments.
ons on this subject have been established
ed experiments, and some time ago they
roborated by what was observed at the
works' at Whitstable, in Kent, for the
contact with the copperas remained
hile that surrounding it was destroyed
.

" I am, Sir, &c.

" J. MURRAY."

st 20."

" To the Editor of the Times.

" Sir,—Having read in the columns of your journal of the 26th inst. (August), a letter, under the signature of ' J. Murray,' in which the writer advances his own suppositions as if they had been facts already proved by experience in practical results, I request the favour of a place in the same respectable medium for a few observations I beg leave to make on a subject of unquestionable interest to the public.

" As the gentleman has not disputed the efficacy of my process for preserving timber from dry rot, or decomposition, which is supported by so many indisputable practical proofs, and by the most eminent scientific and practical authorities, and adopted as it is in so many places by the first architects and engineers, I decline saying more than that I can assure the writer of the letter alluded to, that I have instituted many experiments to test the consequences of this application as regards salubrity; and what is much better, and pre-eminently conclusive, that Professor Faraday has followed up a course of experiments with the same views. I beg to refer Mr. J. Murray to Professor Faraday's lecture for the learned Professor's opinions on all the bearings of the subject, and for the result of his satisfactory and conclusive experiments, worth a host of idle theories and ignorant prophecies.

" I also beg you, sir, to add the enclosed copy of a letter from Dr. Birkbeck, the learned President of the Mechanics' Institution, so long and justly celebrated for his scientific and chemical attainments, giving that learned gentleman's clear and decisive views. Such authorities, so eminent for chemical science, cannot fail with a candid public to put the matter at rest.

" I have the honour to be, Sir,

" Your very humble servant,

" JOHN HOWARD KYAN."

" Ailsa-park Cottage, Richmond."

" 50, Broad-street, Aug. 28.

" Dear Sir,—It gives me great pleasure to find that public attention is beginning to be attracted towards your method of preserving wood from decomposition or decay. I am so fully satisfied with the results which I have had the pleasure of examining, that I cannot hesitate in recommending it wherever I may have an opportunity, and shall indeed be happy to extend the knowledge of your valuable discovery through every channel which I can command.

" If you advert to the progress of many useful inventions, you will find that ignorance, interest, and prejudice, have invariably laboured to oppose them. You will not, therefore, be surprised that attempts have been made to injure your undertaking. You may not, however, be prepared for an attack such as appeared in the *Times* of yesterday, where, under an affected regard for the health of the British seaman, the writer, as the concluding paragraph shows, degrades your plan for the purpose of recommending one of his own. That the writer was ashamed of his chemical objections, the guarded and conditional manner in which they are advanced sufficiently evinces — the mere tyro in chemistry would, indeed, easily refute them. The impregnation of food with corrosive sublimate, by the interference of ' insect life,' &c., and the ' absorption ' by ' respiration and the cuticular surface,' from an atmosphere impregnated by contact with the wood containing in its whole substance so small a quantity of the poison, and that too partly combined with albumen, if not partially decomposed by it, are indeed subtile objections; but the assertion, that, in tropical climates especially, these ships will be

injurious to human health, 'as the quicksilver mines of Idria and Almaden,' is too ridiculous to demand the slightest attempt at refutation. Nothing but the blinding and overpowering influence of self-interest could have compelled Mr. J. Murray to publish such a satire upon his own knowledge.

"By this effusion in the pages of the *Times* your project cannot be deteriorated; and I have no doubt that you will not only retain the good opinion of it already formed, but rapidly extend it. That this extension may soon occur, is the sincere wish of,

"Yours, very faithfully,
"GEORGE BIRKBECK."

"Mr. Kyan, Ailsa-park Cottage, Richmond."

Sir,—When I wrote the letter in the *Times* respecting Kyan's method of preventing "dry rot," by the dangerous or more than questionable application of "corrosive sublimate," I did not anticipate such a furious onset as I received from Dr. Birkbeck.

Dr. Birkbeck, as well as any other, is at liberty fairly to discuss the merits of the question on chemical principles; but when he so far forgot himself as to *impugn my motives*, he went farther than he was warranted to do, or his friends would have wished. I am not aware that this individual has recorded any thing in the annals of chemistry that would entitle his opinion, on any subject purely chemical, to particular deference or attention; but if I should accidentally have overlooked any thing he has done for chemistry, I shall make the *amende honourable* as soon as it is pointed out to me.

It should never be forgotten that ridicule is not argument, and that the ebullition of passion too often betrays a bad cause. Truth is calm, dispassionate, and sober. I have been in the habit of lauding Dr. Birkbeck for his zeal in favour of Mechanics' Institutes—a cause in which I have myself assiduously laboured, and I trust not without success. Dr. Birkbeck's lucubrations might well have been spared, for I may safely say, that where he has expended 1*l.* in the cause of philanthropy I have sacrificed 50*l.*

I had advanced no problem for solution—it was no hypothesis, or theory. I *incidentally*, it is true, adverted to a plan I had pursued with success, leaving it to be adapted or not. I had *no patent*, and wished no monopoly—the *adoption of the plan* by individuals or communities can never benefit n farthing. I wished to do good, is hard to be calumniated. The tion is very serious. The healt lives of ships' crews are in jeo and a measure so fraught with ought not to be adopted witho most rigorous and searching inv tion and inquiry. The *ipse dixit* one should be taken on credit, esp such as are parties interested. T pense of Mr. Kyan's mode of prev will be enormous; but I consid merely a secondary affair, and sha nothing to the rejoinder I have the Editor of the *Times*, save this, that the more I consider i more fully am I persuaded of it ger. I speak as an experimentalis when we take into the account t periments of Libri and Fusenieri effect of electric currents, and c an exact temperature with the ci stances under which "corrosive mate" is decomposed, the qu amounts in my mind to demonstrat

Sir Humphrey Davy abandone application of "corrosive sublimat the very reason I have endeavou substantiate more fully, and Pro Burnett has elsewhere recorded opinion that it may prove as injuri health as the "mines of Idria." this substance which Mr. Waterto ploys for his zoological preparation

After having toiled for nearly a ter of a century as a successful e mentalist in chemistry, it will not be believed that I am so ignorant principles as Dr. Birkbeck has e voured to represent me to be.

As Dr. Birkbeck flies off at a tan without condescending to explain self, it is difficult to understand wh means about *albumen*. If the "c sive sublimate" is to be combined *albumen* before its application, I ca form him that its efficiency wou totally destroyed, being thus ne ized. If it alludes to the album the timber, which, like the mush producing-stone of Italy, is the n of the "dry rot," this is mere ass tion, without proof.

I remain, Sir,
Your very humble servant,
J. MURR

Hull, October 8, 1834.

THE DUBLIN AND KINGSTOWN RAILWAY.

(From Saunders's Dublin News Letter.)

Yesterday (October 9,) a train of carriages proceeded, for the first time, the entire length of the line, from the station-house at Westland-row to Salt-hill. A great number of ladies and gentlemen, invited by the kindness of the directors, enjoyed this so novel a treat in this country. Amongst others we observed the Earl of Longford, who, with all the other voyagers, appeared greatly delighted with the trip. There were eight carriages attached to the train—one of the first class, three second, and five of the third class. The first trip was made by the locomotive-engine called the Hibernia, but there were many disadvantages against which she had to contend—she was not perfectly adjusted, one of the piston rods was one-eighth of an inch longer than the other, besides the rails were in bad order from the wet, which increased the friction considerably. At eight and a half minutes past twelve the train started, all the preliminaries having been by that time adjusted, and labourers on the road having ceased from work lest any accident should occur. The following is a tolerably accurate note of the time taken to reach the respective places named on the journey out and home:—

To Kingstown.

	MINUTES.
The engine-house or hospital	9
Merrion station-house.....	4
Williamstown	2½
Seapoint-house	1¾
Salt-hill	2¼
	19½
Deduct for delays	4
Journey out.....	15½

To Dublin.

From Salt-hill to Seapoint	2
Williamstown	4¼
Merrion	5¼
The engine-house.....	4
The station.....	11½
	27
Delay.....	4
Journey home.....	23

The delay was occasioned by the necessity of slackening the pace to change the line of rails, the whole not being yet perfected. The change going out took place at the engine-house, returning at the dock-brewery. The trains had to stop in each case, go back a certain distance, and when the *shunts* or points were altered they then proceeded.

The Hibernia locomotive-engine was made by Sharp, Roberts and Co., of Manchester; *it is worked by upright cylinders, but this trial was not a fair one to* judge of the merits of the machine. Mr. Bergin undertook the guidance of it for the trip; he was assisted by the foreman of the manufacturers. Nothing could surpass the admirable manner in which the spiral springs which are attached to the buffers, which ward off the concussion when the train is stopped. These have been but recently applied, as we understood, at the suggestion of that very ingenious and talented engineer, Mr. Bergin, one of the officers of the Company.

The second trip was made by the Vauxhall, manufactured by Messrs. Forester, of Liverpool, and named after their extensive manufactory. The train started at sixteen and a half minutes past one, and performed the journey to and from as follows:—

To Kingstown.

	MINUTES.
The hospital	4½
Merrion	7
Williamstown	2½
Blackrock	1½
Seapoint-house	1
Salt-hill	2
	18½
Delay	4
	14½

To Dublin.

Seapoint.....	4
Blackrock	1½
Merrion	5½
The docks	8
Station.....	7½
	26½
Delay	4
	22½

There was a considerable drag on the velocity of the train, from the fact of three breaks or drags being upon the wheels, thus increasing the friction to a very great degree. The wheels of the carriages were not oiled; and besides, in the return, there is from Haig's-lane to Westland-row a rise of 1 foot in 440, which increased the drag upon the engine nearly 50 per cent. The engine in this case was directed by Mr. Forester, one of the respectable firm by whom it was manufactured. Every person who joined in the trip was delighted with the perfect ease to themselves. Many persons expressed themselves to the effect—"who would travel on a rock car when the railway was at their hand?" We sincerely trust the general completion of the works will admit our fellow-citizens at large to enjoy the pleasure of a steam trip such as we have had yesterday. All apprehensions of fear will soon vanish, when they experience the great comfort and accommodation with which railway conveyances will present them.

NOTES AND NOTICES.

A Travelling Nuisance.—Sir, I am a great lover of fresh air, and when business calls me from London I delight in rushing through it on the roof of some well-appointed coach. But, alas! no sooner do we get off the stones than out come the cigars. Pray, sir, cannot you, or some of your readers, contrive a plan by which these chimneys may be made to consume their own smoke?—SNIFF.

Obelisk of Luxor.—It is said to have been at length determined that the obelisk of Luxor shall not be fixed in the Place de la Concorde, but at the *rond point* of the Champs Elysées, as in this situation it will less impede the double perspective of the Tuileries and the Arch of the Etoile, and will be more properly situated between masses of verdure, than among the modern buildings it was first intended to occupy.—*Galignani's Messenger.*

Commercial Wisdom.—A specimen of the wisdom of the French anti-free-trade system has just been mentioned to us by a steam-engine maker of eminence in Yorkshire, who has recently returned from France, where he has been employed in setting to work some of the steam-engines constructed by his firm. According to this gentleman's statement, a pair of steam-engines of a given power made in England, cost 800*l.*, while a pair made in France, of the same power, cost 1,400*l.*; but the French laws, in their great wisdom, impose a duty of 300*l.* upon the importation of the English engines, and in that way raise the price, with the carriage and cost of travelling to set them to work, so as to make them cost nearly as much to the French manufacturer as the engines of his own *privileged* engine-makers. This is a strange way of upholding the manufacturing interest of France. —*Leeds Mercury.*

Scotch India Muslins.—We have recently been assured that a piece of muslin, manufactured at Paisley, was purchased in India by the son of the manufacturer, and sent home as a specimen of the superiority of the products of the Indian loom.—*Athenæum.*

Human Strength.—From experiments made at Portsmouth dock-yard, in driving and pressing in iron and copper bolts, a man of medium strength, striking with a mallet, weighing 18 lbs., and the handle 14 inches long, would start a bolt about one-eighth of an inch every blow. It required a pressure of 107 tons to press the same bolt down the same quantity of space, but a small additional weight pressed it completely home.

Iron Steam-boat.—A large iron steamer, 96 feet long, was lately launched at Selby, built by Mr. Fairburn, of Manchester, for Swiss owners, and is intended to ply on the Lake Zurich. She will be navigated as far up the Rhine as possible, and then taken to pieces, and carried overland to her destination. She draws less than 12 inches water, without cargo. This steamer was built at Manchester, taken to pieces and brought to Selby, put together and launched, and when taken out of the water, will again be taken to pieces, carried overland a distance of 40 miles in a rugged country, and ultimately launched at Zurich; and, after all this, will be considerably cheaper and better than if built on the continent.

Liverpool Railway.—According to the Report read at the fifth half yearly meeting of the Liverpool and Manchester Railway Company, held at Liverpool, it appeared that the increase of the *number of passengers in the half* year ending 30th June, was 29,255, and of merchandise 7, conveyed to and from Manchester. The of receipts for passengers was 50,770*l.* for merchandise, 44,014*l.* 5*s.* 4*d.*; total 94,784*l.* 12*s.* 3*d.*; total amount of e 60,692*l.* 15*s.* 11*d.*; net profit, 34,691*l.* added to this was 1,332*l.* 2*s.* 2*d.*, the surpl of the half year ending 30th June, 1833, 36,023*l.* 18*s.* 6*d.*, from which sum the Co were enabled to recommend a dividend o per share.

Armed Steam-boats.—Large steamers building at Sheerness, Chatham, and W which are to carry two bomb cannons, mo swivels, so as to command an extensiv without altering the course of the vessel. non is to be so situated on the after-part of as to range entirely over the stern, and a ward as the paddle-boxes will permit. T is to be mounted before the wheels, and v mand each side from the bow to the for the casing of the wheels.

An Eel-skin Water-proof Dress.—An in a butler in a respectable establishment i cinity of Welling, Kent, has made a water-proof dress, which bids defiance t verest weather; the dress is composed of of eels, with which he has made a cap, ja trousers; and so impenetrable are the s so well arranged, that if the wearer were to the heaviest shower of rain that could fall, not one drop would penetrate his would be well if persons exposed to the were to line their garments with this us heretofore, neglected commodity. The i here mentioned, has applied the skin e and the dress is, on account of the vari lours which the skins possess, really n handsome, and of great utility in bad v and would, probably, prevent many r attacks.

Effect of Moonbeams at Sea.—A corre in mentioning the non-existence at sea rocks which are laid down in the " Charts," remarks:—" I have frequently that the moonbeams striking from bet clouds upon the surface of the sea at some when the waves are broke by a fresh bre an appearance so much like that of brea be taken for such by most persons on bo probable that many of the rocks in which are marked down in the 'Charts,' this origin; but none of them ought to be until their non existence has been decid blished. They have, meanwhile, the g of exciting vigilance at sea."—*Guernsey*

Mr. Aldersey's reply to Mr. Landal next.

Communications received from Mr. W.—H. S. B.—Θ—E. S. W.

The Supplement to the present Volu Contents, Titles, and Index, and Portrait of the late Mr. Telford, will be publish 1st of November.

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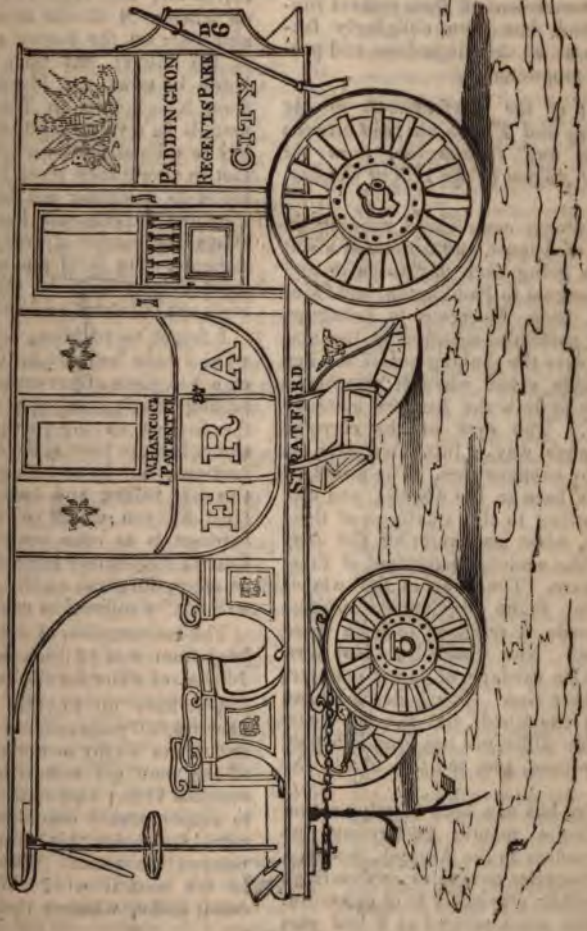

HANCOCK'S STEAM-CARRIAGE ERA.

VOL. XXII.

MR. HANCOCK'S STEAM-CARRIAGES.

We give on the preceding page an engraving of Mr. Hancock's new steam-carriage the Era, which has been plying for these several weeks past along with our old acquaintance the Autopsy, between the City and Paddington. It is by far the best which Mr. Hancock has yet constructed; extremely compact, elegant, and efficient. We subjoin an authentic, and at the same time very candid and honest statement of the performances of both these carriages since the commencement of their present running, which has been obligingly furnished to us by their ingenious and persevering proprietor.

Statement of the Performances of the Autopsy and Era on the road between London and Paddington, from the 18th of August to the 11th of October, 1834.

The Autopsy commenced running on the 18th of August, and continued about a month going each day twice to and from Moorgate to Paddington, and twice to and from Moorgate to Islington. Nothing particular occurred to the machinery, save the shaking out of the key of the slide valve, when it was found necessary to draw the Autopsy home by the Era. The eyes of the carriage springs gave way a little, but were replaced by stronger ones. The principal wear has been in the wheels; and this chiefly owing to the smallness of their diameter, when encountering the deep holes in the wretched pavement of Finsbury-square. The tires of the wheels were also found to elongate rapidly, which made it requisite to have them contracted. New wheels have just been put on this carriage, of larger diameter and thicker tires. The boiler has been carefully examined, but not the least perceptible difference has been detected. The fire-place, too, remains nearly the same.

The Era has now been running rather more than a month, performing the same distances as the Autopsy, but in a manner superior to that or any carriage I have either previously built or known. The crank shaft severed at a bad part of the bad pavement in Finsbury-square a day or two after she commenced running; but this was replaced, and the carriage started the r
ing at the usual hour, and
since continued at work, with
sion of only one journey, ar
the extension of an unsound p
casting of the wheel flange.

I find on this hard road t
are severely tried; but this r
as it is, has been of inestimab
me in regard to experience,
out, with unerring certainty, w
strength is wanting. The Stra
for instance, would have com
ceived me, with regard to wea
of wheels. I should estimat
and wear on the former at d
of the latter; but then it
borne in mind, the Macadan
from King's-cross to Tottenh
road is in a very rough state.
advise all parties interested to
fact in view; they must bring
hicles to a similar test before
conclude experiments having
object the means of arriving
estimate. On level and smoo
great display may be made,
trials are fallacious and decepti

I forgot to mention, that s
when I have had to take up a
on a bad piece of pavement, i
pelling wheels chanced to stop
the friction on the (perhaps
stones has not been sufficient t
carriage, but by reversing the
the slide valves, and backing
(just as you would with h
carriage is at once propelled
But we may surely hope that
or other, the great public thor
will not be suffered to remain

The consumption of coke ha
been from 8 to 12 lbs. a mile,
100 lbs. of water for the same

We have up to this tim
nearly 4,000 passengers in perf
and I am happy to say that
of the road get more friendly
conciled to us; and as it is my
to employ steady coach-drivers
men, the sooner this feeling is
veloped the better. Why sho
be the least ill-will? What
can it make, whether they dri
or

" Sweep o'er the hills in the glory o

I intend next week to advan

step, and to go one journey more each day. I have been blamed for not doing this sooner, but others may do as they please. I am content to move slowly, so that I continue to move well, although it may be at the expense of a little "ignorant impatience" on one side, or the want of "absolute wisdom" on the other.

W. HANCOCK.

TWIN STEAM-BOATS — MR. ALDERSEY IN REPLY TO MR. LANDALE.

Sir,—I request the indulgence of a column in your useful Magazine, for the purpose of replying to the observations of your correspondent, Mr. Landale, on my article on the twin-boat, which appeared in your No. 577; and I must beg to bespeak your patience, and that of your discerning readers, while I proceed to notice severally the different points on which he expatiates.

There is a considerable degree of discrepancy in Mr. Landale's first observation, in which he states that he found nothing new in my plan of the twin-boat, while in the next page he says, "the only improvement I can see in Mr. Aldersey's plan is in the bows," and admits, that the "water-course being parallel from end to end, obviates the impediment of the accumulated water at the bows." Here I would ask Mr. Landale, if the bow-rudder, fixed on an additional stem, and made to hang fore and aft, and to swing and steer, precisely on the same plan as the rudder at the stern, is not new? I can tell him I am quite sure it is new to him, unless he has seen my publication of it in the "United Service Magazine" for February, 1833; and I would also ask, if that useful appendage the breast-board is not new? It is, however, *the utility and superiority of the twin-boat*, compared with single-bodied steam-vessels, I am advocating, and not the novelty of it.

Mr. Landale next refers to the wheel, and says, "Mr. Aldersey supposes his boat will sail as fast as the velocity of his wheel; if this were the case, what is to keep up the motion of his vessel?" On this point I inform Mr. Landale, I do expect the twin-boat would sail as fast as the velocity of the wheel, and for this plain reason, that I have given the float so great a portion of surface measure, to come in contact with a body of water so great, that the water should by its inertia so effectually resist the action of the float or paddle, as to remain nearly, or quite stationary, by which means the whole of the engine power would be spent in driving the vessel forward. It must, I think, be obvious to the most superficial observer, that there can be no sort of comparison between the resistance of the water to the vessel's progress at the bow, when nearly the whole of it is removed by the improved form of the bows, in connexion with the water-course, and the resistance the float at the stern must receive from the immense body of water coming in contact with a paddle, containing no less than 36 square feet superficial, especially when we consider that the bows meet with (comparatively) little more resistance than cut waters. For this reason I have given the float all the surface measure the breadth of the deck would admit, and should have done the same if I had proposed the water-course to be 16 feet wide instead of 8, and that for the sole purpose of increasing the resistance of the water by its inertia to the action of the wheel. In this case, and also in that with the water-course of only 8 feet, I have no doubt but so great a body of water would so effectually resist the action of the float, as to remain in a state nearly quiescent. Does Mr. Landale think for a moment, that because it would require an immense power to throw back so great a body of water with the velocity with which it is usually thrown back by the wheel of a common steam-vessel, the same power is therefore necessary to drive the twin-boat forward, where nearly the whole of the resistance at the bow is removed? He might as well suppose that the quantity of gunpowder necessary to send forward a cannon-ball should not be less than would be requisite to throw back the cannon itself with the same velocity; or that the locomotive-engine, which drags a train of carriages on the railway, exerts a power sufficient to tear up the railway itself, which supplies the necessary resistance to the wheel. In these cases the degrees of resistance dif-

fer very widely, but the principle is the same precisely.

The next point Mr. Landale refers to is the timing of the wheel, to produce the velocity of 24 miles an hour. Mr. Landale says, "to produce 24 miles an hour the wheel would have to make 60 revolutions a minute." Here, it appears, Mr. Landale is altogether in error. If he will take the trouble to look again at his calculation, he will find that a wheel 16 feet diameter is in measure 5 yards 1 foot, and the circumference 16 yards, which multiplied by 45 gives 720 yards a minute, which for 2½ minutes gives 1,800 yards, say a mile (more by 40 yards), or 2 miles in 5 minutes, which certainly must be 24 miles an hour.

Mr. Landale next proceeds to say, "Mr. Aldersey has *prudently* omitted to give us the necessary power to drive a wheel 16 feet diameter, 18 feet broad, and 2 feet immersed in water, 60 turns a minute." Certainly, Mr. Landale, I have the common sense so to do, or you may, if you please, call it *prudence*: but it is not a prudence partaking of the character you seem desirous of attaching to it. I have no fact to conceal, nor wish to shrink from any it may be necessary to state; but if I had made my calculation of the necessary power of the engine to drive the twin-boat forward on the same ground Mr. Landale does, I should have made a most notorious blunder. I consider I began at the right end, and having given the paddle all the surface measure the breadth of the deck would admit, and stated the requisite velocity of the wheel, I proposed and intended bringing up the power of the engine necessary to produce such a velocity, being well aware that having removed the greater part of the impediment to the boat's progress from the bow, the real engine power necessary to give the required velocity of the wheel would be a very moderate one. Mr. Landale might, I think, easily satisfy himself on this point, if he will credit the well authenticated accounts of the Paisley canal boat—a boat 70 feet in length, and 6 feet in breadth, carrying 90 passengers more than 9 miles an hour, by means of the trifling power of 2 horses, and these horses drawing to great disadvantage, by not drawing in a right line with the centre, or keel of the boat, but obliquely. If Mr. Landale will place another such boat by its side, with the bows formed as in my drawing, and a water-course of moderate breadth between them, he will present a twin-boat to the public in all respects near as possible to the plan I have recommended, and ascertain pretty correctly the necessary power to drive such a twin-boat 24 miles an hour; and from the results to be seen every day by the boat alluded to, may convince himself that the power necessary to drive a twin-boat 24 miles an hour would not be one-fourth, perhaps not one-eighth, of that, which would be necessary to drive so great a body of water back, with any degree of velocity, as must come in contact with a paddle of 36 feet superficial measure. Mr. Landale will also do well to recollect the fact, that the two horses above alluded to can drag the boat with its load 9 miles an hour with much greater ease than they can 5 or 6 miles an hour. This may appear paradoxical to Mr. Landale, but he will, I hope, receive and admit the fact. Should this mass of evidence not be sufficient, I would refer him to the results of the American steam-raft—a form of twin-boat by no means the most favourable to produce the best results.

It seems also that Mr. Landale prefers the reciprocating motion of the oar to the rotary motion of the wheel, notwithstanding half the time is lost in making the back stroke, and the muscular strength necessary for that purpose entirely wasted. I would ask Mr. Landale what is the paddle of a rotary wheel *in principle*, but the blade of an oar? and what is the wheel itself, but a circular frame, to which are fixed a certain number of such paddles, acting in and upon the water in rapid succession, without interruption from the reciprocating motion? What sort of figure would the wheel cut, and what would be the loss of power, if it had to make the reciprocating motion like the oar of a boat?

I presume, Mr. Editor, what I have said is sufficient to satisfy all your mechanical and discerning readers; and as I am quite aware that controversial discussions must necessarily be wearisome,

ll take my leave of your corre-
nt Mr. Landale, so far as re-
o his observations on my article
e twin-boat in your No. 577. I
owever, to add, that it is my
pinion that in a very few years
win-boats will entirely supersede
-bodied steam-vessels, for all the
es to which their form and strength
them competent, being very much
in their hulls, much less ex-
e in building, relieved at the bow
so great a proportion of the im-
ent to velocity, and from their
ty of furnishing so great a pro-
of surface measure to the paddle
stern by means of the water-
. To all which must be added,
valuable capacity of carrying an
ted measure of sail with perfect
not only before, but upon a wind,
exclusively attaches to the twin-
not being subject to a rotary
.

ill go still further, and without
ion assert, that, as far as relates
principle of the twin-boat, driven
m-power, there is no limit what-
its velocity, because the velocity
ways be in proportion to the steam
provided the diameter and timing
wheel be in accordance therewith.
re, however, not to forget, that
a limit to expediency, and that
a limit to human effort, and at
oints only is the velocity of the
at to be arrested.

I remain, Sir,

Yours respectfully,

W. ALDERSEY.

tton, near Hackney,
t. 14, 1834.

ON'S METALLIC PISTONS—DR.
REGORY IN EXPLANATION.

—As my name occurs in a way
a little surprises me, in an extract
he "Register of Arts," made by
aluable correspondent Mr. Bad-
(p. 38 of your last Number), and
ectness of statement is always of
nportance, I trouble you with a
w lines.

statement, in reference to Mr.
s metallic pistons, has appeared
ime in the "Repertory of Arts"
ame, it was not transmitted by
me, nor did I know of its being sent,
nor am I acquainted with its contents.

It is always painful to give a positive contradiction to a *positive* statement, though only made anonymously. I will, therefore, simply remark that I have *not the slightest recollection* of ever having pistons of Mr. Barton's construction brought from Woolwich dock-yard for my inspection. Some of his pistons which had been at work for a few months, were brought to me from another quarter, I think, about March, 1827; and the protrusion of the angles of the wedges, beyond the general surface of the piston, had worn the interior surface of the cylinder into furrows, as was naturally to be expected, from the imperfect construction of Barton's pistons at that period.

The only time in which I entered into a minute and careful inspection of Barton's pistons, was in the spring of 1827, when Mr. Barton brought an action against Messrs. Hall and Sons, of Dartford, for infringing his patent. I then thought Messrs. Hall's pistons decidedly preferable to Mr. Barton's, and I think so still. I, also, then thought Messrs. Hall's pistons no infringement upon Mr. Barton's patent right, and I think so still.

The interest which I took in the comparison, passed away with the occasion. But, as correct views of the progress of inventions and improvements are always important, I send for your perusal some papers connected with the subject of Barton's piston, and others, which have lain by me from the time when my attention was professionally called to the subject.

I am, Sir,

Yours very faithfully,

OLINTHUS GREGORY.

Royal Military Academy,
October 20, 1834.

[We have examined the papers obligingly forwarded to us by Dr. Gregory, and fully agreeing with him as to the importance of placing on record a correct statement of the progress of all valuable inventions and improvements, even from their earliest stages, we propose to avail ourselves at an early opportunity of the excellent materials which they afford, for a historical sketch of metallic pistons, from the time of their first introduction by the celebrated Dr. Cartwright. It is but fair, in the meanwhile, to observe, that Dr. Gregory is by no means the only eminent man of science who has expressed a similar opinion respecting the originality of Mr. Barton's piston (as first constructed), and that in the action for infringement brought against Messrs. Hall and Sons, the verdict was for the defendants.—ED. M. M.]

ON WORKING INCLINED PLANES.

Sir,—A correspondent of your valuable Journal (No. 580) seems rather displeased with the observations made by myself and others, with respect to Mr. Hoar's plan to stop carriages when the chain breaks on the St. Helena inclined plane. If he would look again, he would see that nothing was said against its usefulness at St. Helena, where one truck only is working on the chain at the same time, and the distance the truck has to move to and from the plane is probably very little, and the quantity of weight (compared with regular working planes) very small indeed. What I intended to say was this, that such cumbersome carriages as those represented as being in use at St. Helena, would not do for general use on inclined planes, where there are carriages of various make, to suit the different kinds of goods, going up and down the planes by hundreds in number, and which have to go over many miles of road to the top and from the bottoms of the planes.

We have here, at Blaenavon, four stages of inclined planes, all in a line—the bottom of the uppermost ending close to the top of the next below it; the whole line of planes is near 1,200 yards. The upper part of the top plane has an angle of 45°, and is formed on a rock, as is the St. Helena one. I have seen 12 tons weight upon the chain at the same time. Now would your correspondent wish to convince any practical man that when the chain breaks on such a plane, the spikes under Mr. Hoar's trucks at St. Helena, or his own broad shaped claw, or claws, or anchor-like things attached to his waggon plan, being dragged by the above weight at the above angle, and, moreover, upon a rocky bottom *(or any other bottom)*, and with a speed at starting of about a mile a minute—I beg leave to ask him if he would wish to persuade any practical man, that either of the two plans would be of any service to stop the carriages on the inclined planes when the chains break? Besides, if there was the least probability of such plans being of any use to stop the carriages on the planes, *they must be removed from the carriages at top and bottom of the planes. No one would ever think of taking them* encumbered with the anchor-like thing so many miles upon the level roads, above and below the planes, as the transfer of goods is required to go. The only fault your correspondent has to find with my chain-bridles and toothed-rail, is not that the bridles will not catch hold of the teeth on the rail (for he seems to think they would do that), but that they would pull up the rail. If that, however, is the only fault of that (very simple) plan, I know that it is quite a surmountable one.

But after all that has been said, good chains properly made, good tackle of all descriptions, machinery that will work true and steady, and careful hands employed at the top of the planes, are the grand requisites wherever a deal of business is doing.

But to return to the St. Helena inclined plane. It was stated in the description of that inclined plane, in the Mech. Mag., that the goods, &c. were drawn up it by three mules working the machine at the same time; and if my recollection serves me right, they worked the machine with 12 feet levers, the chain lapping on a 2 feet drum. Now, how was it possible for the united strength of those mules, on such a plane, to break a chain made with half-inch iron (as I understand was the size of the first chain used on that inclined plane)? The iron must have been either radically bad, or there must have been very bad work in the making of it.

I am, Sir,
Your obliged servant,
THOMAS DEAKIN.

Blaenavon, October 10, 1834.

THE LATE CONFLAGRATION OF THE TWO HOUSES OF PARLIAMENT — IGNITED FLUES, THE CAUSE OF ONE-FIFTH OF THE LONDON FIRES.

Sir,—Having always been a strong advocate for the employment of machinery for chimney-sweeping, I have observed, with much real pleasure, the spirited manner in which this important subject has been treated in your journal; and I feel greatly indebted to your able correspondent, Mr. Rosser, for his zealous exertions on behalf of the poor climbing boys.

From personal observation, I know that

there are comparatively few chimneys that cannot be swept *better by machinery* than by children; and that most of the others might, without much difficulty, be so altered as to render them capable of being cleansed by the same means. All new chimneys can be constructed as easily to suit the machine as otherwise; and the clause in the new bill which enacts "that all chimneys hereafter to be built or altered, are to be so constructed as to admit of being swept by machinery, under a penalty of 100*l.*," is likely to prove highly beneficial, and most effectually to promote the general employment of mechanical sweeping.

Mr. Rosser, with much propriety, alludes to the fact, that a very large number of houses are annually burned down *from defects in the construction of chimneys*, or *from the cleansing of them being imperfectly performed*.

By referring to my last report of London Fires, at page 276 of your 20th volume, it will be seen that the number of fires actually traced to this source was 71; and there is good ground for believing that many of those fires, the origin of which could not be clearly ascertained, were, in fact, occasioned by similar causes.

There has been much defective building about chimneys, and, in numerous instances, great want of precaution in the erection of flues. Within the last eighteen months a most surprising number of buildings (and many of them more than once) have been placed in jeopardy from these circumstances; the Jews' Synagogue, in Duke's-place, Aldgate, for instance, has been set on fire *three times* by the *flue*, within the time mentioned!

When a chimney has been unswept a long time, or has been imperfectly cleansed, a great nuisance arises, which becomes evident in various ways, and plenty of warning *is usually* given; the fire ceases to draw, the apartment becomes smoky, soot is continually falling, and at last a slight rise of the flames beyond the usual height sets the chimney on fire, and endangers the building; the inmates are subjected to much real inconvenience and alarm, to say nothing of the expense. In most provincial towns, *certain fines* are imposed upon all persons whose *chimneys take fire*, as it is *always supposed to arise from* neglect; in London we have no fines for this offence, but the inhabitants pay a much heavier penalty in the shape of *fire-rewards*, which, if three engines are in attendance, amount, with the turncock's fee, to 3*l.* 10*s.*; and it will hardly be believed, when I state that the inhabitants of London pay upwards of 150*l.* *per month* in this way: such, however, is the fact.

Whatever might have been the opinion of the Insurance Companies, with respect to mechanical chimney-sweeping at the time it was in its infancy, when it was certainly rude and inefficient, certain it is that at the present time they are sufficiently alive to their own interest to encourage rather than oppose its general introduction; most of them employ the machine for sweeping the chimneys of their respective offices, and otherwise sanction its use: to act differently, would be to advocate the continuance of the most fruitful source of accident, and to perpetuate the circumstances which occasion *one-fifth* of all the London fires.

For cleaning chimneys, I am acquainted with no machine superior to Glass's, which I consider very efficient, although, of course, open to those improvements which long experience with its use can alone suggest.

I agree with Mr. Rosser in his opinion, that some apparatus may be designed for the purpose of examining and repairing chimneys, that shall materially assist the workman in this office. Boys should upon no account be intrusted with this important duty; and I think a man of small stature, equipped with something of the following description, would readily discover, and easily repair, any defect that might exist.

In the first place, a small strong iron chain should be provided, with stirrups for the feet, and a leather belt to fasten round the man's body; from a circular iron plate, sufficiently large to cover the top of any chimney, should be suspended a brass or gun-metal pulley; the pulley would serve to carry the chain, while the plate would effectually stop any unpleasant draught, or it might be made so as to regulate the quantity of draught, according to circumstances. The man should be furnished with a strong leather helmet, similar to those worn by the men of the London Fire-engine Establishment, with

a suitable provision on either side for affixing two small bull's-eye lanterns, using one or both at pleasure.

In using the apparatus, the pulley-plate is to be placed on the chimney top, each end of the chain descending into the room; the workman, equipped with his helmet and lights, puts his feet into the stirrups, and buckles the belt round him, and then either raises himself by pulling the other end of the chain, or he may be raised by an assistant to the part requiring examination. He will not be incommoded by any unpleasant draught; and by using the lanterns in the way stated, a strong light will always be thrown upon the part to which his eyes are directed: the belt will carry very conveniently such few tools as the work may require, and should also have a hook to fix on the opposite end of the chain, so as to support the man steadily at any required point in perfect security.

By continual strong appeals to public sympathy *white slavery* must be eventually abolished, and I hope all your contributors will readily throw in their mite of information on the subject into the general fund. Sincerely trusting in the ultimate triumph of the good cause,

I remain, Sir,
Very respectfully yours,
WILLIAM BADDELEY.

London, October 20, 1834.

P. S.—I was disturbed in the middle of this communication, on Thursday evening, by the awful conflagration of the two Houses of Parliament, which is, by many persons, supposed to have been ignited by the flues in the House of Lords. On the Saturday following, the Colonial Offices narrowly escaped a similar fate—having been set on fire by a flue; the prompt attendance and active exertions of the firemen, however, soon succeeded in extinguishing this fire.

ADDITIONAL PARTICULARS RESPECTING MATERIALS FOR PAPER-MAKING.

Sir,—I have just read some excellent remarks of your well-informed correspondent, Mr. Baddeley, in reply to my communication recommending one or two articles as materials for paper-making; but when Mr. B. speaks of the "fibrating process," as being necessary to prepare those articles "before they are fit for paper-making," he is looking to a higher process of this species of manufacture than I was. When I mentioned the "Indian ear corn leaves" as suitable for the purpose, my meaning was merely to recommend them as fit for a species of paper of no higher quality than royal hand, or sugar paper, for which, with a half mixture of rope, they would prove extremely suitable, and would make what is in great request by the *grocers*, a tough wiry paper, capable of bearing the twist, a term which is known by *that* trade, as being necessary for loaf sugar bags in particular.* Nothing more would be required, in this common sort of paper-making, than to place the Russia matting or corn leaves at once in the engine, and convert them into a pulp: this would be the only preparatory state they would require. Mr. B., I dare say, is aware, that many very inferior articles are used by different makers for making grocers' sugar paper, box boards, &c. Even the common wall-paper (the old tearings of paper-hangings), which I was the first to recommend to a paper-maker in Hertfordshire, twenty-five years ago, and which is saturated with lime and dirt, is used in the proportion of one half, with a somewhat better material for binding it, for making a common yet useful "royal hand," and is readily bought by those paper-makers it suits, at 6*l.* per ton. If this foul, decayed material, then, is worth so much, I think a package of good sound dry Indian corn leaves may be estimated at, at least, double the price. Indeed, I have no doubt the article will speedily be "look'd up" by the Israelites as it deserves. As to what Mr. B. says of paper shavings having "fallen into disuse," he is in error, because the wholesale collectors are giving from 18*l.* to 20*l.* per ton for what is termed "fine shavings," at the

* There is a rubbishing article called "hand-stuff," half of which consists of the selections of "dust hills," being remnants of old wrappers, rugs, floor-mats, &c., which invariably loses from 25 to 30 per cent. of its weight during the macerating process it undergoes in the engine. To make good this deficiency, a certain quantum of whiting or clay is incorporated; and hence the rotten, imperfect brown, and whitey-brown, papers which are constantly deluging the trade.

present moment. With regard to the necessary deduction from their value for the loss in cleaning, this applies only to the common refuse shavings; but no quality of rags can compare, for cleanliness, with the best sort of shavings. The principle drawback on writing paper made from shavings is, that it invariably wears a cloudiness of hue, which paper made direct from a fine rag is exempt from. Another drawback is the trouble which shavings give the manufacturer to extract former coatings of size.

I will now speak of another article very suitable for making a good brown paper, which has escaped the notice of all writers I have seen on the subject; I allude to those leather shavings which curriers separate from the hide or skin while reducing it to its proper substance. I saw some strong brown paper, called "imperial," made from this article, at Newcastle-upon-Tyne, a few years ago, and it was stronger, and bore the ink better than any paper of this sort I have ever seen, either previously or since. I believe, however, that the application of these leather shavings is to this day but partially known. Nor is this dormancy of knowledge to be wondered at, considering how few paper-makers there are, who know any thing of their business, and what confined notions prevail amongs tthem. I lived twenty years with five employers in this line. One had been a captain in the army, and he lost 18,000*l.* before he would leave off making *foolscaps*; another had served his time to a tanner; a third to an engineer; the fourth was brought up a farmer; and the fifth was a gentleman who would turn tradesman.

I remain, Sir,

Your obedient servant,

ENORT.

Marlborough-terrace, Albany-road.

MR. MURRAY'S RESEARCHES INTO THE NATURE OF FLAME.

Sir,—Mr. Rutter has a right to be believed on his simple assurance, and I should be the very last to doubt his word. The question, however, remains precisely as it was, namely, that the principles *had been eliminated*, and the application made, before Mr. Rutter had engaged in the enterprise. I regret that any *word* ("affair") used by me (it may be, unconsciously and inadvertently) should have ruffled Mr. Rutter's repose—it was quite unintentional. The truism expressed by Mr. Rutter, as far as I know, has never been questioned by any one—Lord Bacon had uttered it long before—*Homo, naturæ, minister et interpres.* But, if Mr. Rutter means any thing more than has been admitted by every disciple of inductive truth, then has no discovery been made since the world began. The question between us is now at an end, since I respectfully decline controversy, willing that facts should speak for themselves, and being perfectly content with their verdict.

The non-transit of flame through orifices formed in *non-radiating* and *non-conducting* materials, I was the first to establish in distinct contradiction to the universally received opinion, and none has ever so far advanced a fairer claim. The recent experiments of Dr. Charles Williams have also fully corroborated my other views respecting *flame*, namely, that though it cannot be denied that there are flames which possess intense temperatures, there are other specific flames which exhibit comparatively low grades of temperature. Thus, Dr. Williams has shown that there are flames into which the finger may be introduced without suffering; therefore, the assumption that "flame, *in all cases*, is inflammable or gaseous matter heated *above whiteness*," "and that to a degree *infinitely* above the *white heat of solid bodies*, is an error of the most palpable description. The *hollowness* of flame in ordinary cases, is a simple fraction of the facts I had established touching the phenomena of flame, and for maintaining which, against the sovereign dicta of the schoolmen of the Royal Institution, I have been honoured with their dignified hostility. Individuals, however, now no longer think by proxy, but presume to judge for themselves.

I remain, Sir,

Your obliged servant,

J. MURRAY.

Sept. 24, 1834.

MR. PERKINS' "HEATER."

Sir,—I hope I shall not be stigmatised as the enemy of discovery and improvement, if I do not recommend what I cannot conscientiously approve; at the same time I may be mistaken in my views, and will ever rejoice to be set right when I happen to be wrong.

There are applications of principles, and asserted improvements, which, even when carried into practice, and at length are discovered to fail entirely, involve no personal risk, such as the *metallic* frames of conservatories, which, as far as I understand the question, are constructed in defiance of those principles which are best calculated to ensure the life and health of the exotics they enshrine. I would leave such to run the gauntlet of public opinion. But there are others which wear a different complexion, and among such I am disposed to rank Mr. Perkins' "heater." When requested to give my opinion, it has been an unfavourable one—coupled with the admission that it is that of a private individual, given as far as he himself understands it, and thus subject to correction.

I confess that I cannot be satisfied with the mere assurance, that if even one, or all, of the pipes charged with *red hot water* should accidentally *burst*, the danger would be trifling. I cannot think so. These pipes, I am informed, are calculated to sustain a shock equal to several hundred atmospheres. Be it so;—it seems, however, to have been overlooked, in the estimate, that *iron*, at *common temperatures*, will decompose water, and *à fortiori*, much more rapidly at a *red* heat. It follows, therefore, that the *external surface* of these tubes, or pipes, in ceaseless contact with the hygrometric vapour of the atmosphere, must be subject to an incessant deterioration, night and day; the film of oxide formed will be continually detached, and thus constantly expose a fresh surface to the process of destruction. Let therefore the original strength of material be what it may, its integrity must at length give way.

I remain, Sir,

Your very obedient humble servant,

J. MURRAY.

Oct. 10, 1834.

SOUTH AUSTRALIA.

Since our review of Dr. Lang's History of New South Wales was written, in the course of which we took an opportunity of making a few passing remarks on the reported objects and plans of the "South Australian Association," a little volume has appeared, in a sort of half-official form,* which enters into fuller details on the subject than the public, previous to its publication, had been in possession of. Its perusal has only added to the conviction, that the new colony, if set up on the much-vaunted "new principle of its projectors," will prove a signal failure.

This "new principle" is nothing more or less than the "keeping up a due proportion between lands, labour, and capital," by a system of virtual slavery—the slaves not being either negroes or convicts, but *only* the labouring men and their families who may be induced, by a hope of bettering their condition, to accept a free passage to the new land of promise. In the work before us, this object is avowed in sufficiently plain terms, over and over again, although, in those parts of it which are addressed especially to the classes most deeply interested, a wretched attempt is made to gloze it over by a misty veil of unmeaning verbiage. It will only be necessary to *confront* a couple of extracts from different parts of the volume, to make it quite plain what the "object" really is. At p. 91 we have the following help to our perceptions:—

"In every colony of modern times, these evils have resulted, in a greater or less degree, from an excessive proportion of land; and, in most of such colonies, have been partially counteracted by the greater evil of negro slavery; as, for example, in the West Indies, North America, Brazil, and South Africa. For, whatever the proportion of land, even where it was so great that every freeman became a land-owner, still, *with slavery*, with human beings who could be *prevented from obtaining land*, there was constant and combined labour with which to employ large masses of capital in raising a produce cheap enough for distant markets. In the prosperous settlements of New South Wales and

* The New British Province of South Australia, or a Description of the Country, illustrated by Charts and Views; with an Account of the Principles, Objects, Plans, and Prospects of the Colony. London, 1834: Charles Knight. 12mo. pp. 229.

men's Land, convicts have, to some supplied the place of slaves. But olonies, without any exception, in here has been superabundance of land any kind of slavery, have been emi- oor and barbarous."

we have an exposition of the of slavery, and, what is more to pose, a definition of slavery itself. , in a new colony, we are told, is man being who can be prevented btaining land." Be it so; and urn over a few leaves, no further p. 106, and see what is to be the on of the labourers who are to be ut to South Australia:—

the price of twelve shillings per acre, koning the cost of passage at 15*l.*, le would add to the colonial popula- the rate of four persons for every l acres. Is this rate high enough? mmission (of Public Lands) will de- nd here we see the *advantage* of hav- ommission specially charged with a of such vast importance to the co- supposing the Commission to *fix such* from time to time, as will PREVENT BOURERS taken out with the pur- oney of new lands from BECOMING NERS, until others shall have ar- take their place in the market of bour, then, for every acre appropri- ere will be a supply of labour where- cultivate it," &c. &c.

, then, the labouring population colony are to be "slaves" to its sts (according to the showing of book before us), just so long as mmission of Public Lands may A goodly prospect this for the man and the artisan of England, strongest motive for leaving the f his birth is always the hope of ig independence. He is to make ge of upwards of ten thousand free of expense though!)—to up all his friendships and con- , to forsake his home for ever—in o reach the happy country in the only way of escape from "sla- the acquisition of land, and in also he is to be "prevented from ng land" (or becoming free), so a commission of English political ns may think proper! An en- bait, no doubt, but one which neated" working *men will find it swallow!*

The projectors themselves seem to have been struck with this. It is all plain sailing, so long as they have to demonstrate the advantages of their slavery system to the masters, but when they come to point out its delights to the intended "slaves"—then comes the tug of war! The following passage is that in which this delicate part of the subject is handled:—

"In South Australia there will be two important novelties. The price of land will take out the labourers free of cost to their employer, and will enable him to retain their services. This will be the first colony combining plenty of labour with plenty of land. Here, then, is a stronger inducement than was ever held out by any colony to the emigration of capitalists.

"Yet it may appear, at first sight, that if the price of land be sufficient to provide the colonial capitalist with constant and combinable labour, there will be no strong inducement to the emigration of labourers; and this, indeed, would be the case if the labour of the colony were always composed of the same persons; since the poor man's chief motive for emigrating is the hope of becoming a land-owner. But, though hired labour will be constant, the persons composing it will be frequently changed. The young men taken out with the Emigration Fund, will soon buy land with savings from their wages; but the amount of labour in the colony will not be less, because every purchase of land will provide the means of bringing more labourers. If the price be sufficiently high, poor labourers taken to the colony will have the prospect of becoming not merely landowners, but masters; a prospect far more gratifying to that class, than the hope of obtaining land without any assistance in cultivating it, which is the best prospect of the poor man who emigrates to Canada. If this plan of colonisation should be well administered, there can be no doubt that every one who emigrates as a servant, will do so with the fairest prospect of having servants of their own, who, in their turn, if they should be industrious and prudent, would become the masters of other servants. Plenty of mere animal enjoyments is all that the poor emigrant to Canada can obtain: over and above this, the poor emigrant to South Australia may look forward to a high gratification of that pride which is the greatest incentive to human exertion. We could not, indeed, explain this prospect to an uneducated man; but here, after a practical explanation of it will be given to the labouring

class at home, by letters from poor emigrants, who will not fail to boast of having exchanged the condition of a servant for that of a master. Meanwhile there are ample inducements to the emigration of labourers. The poor workman who wishes to emigrate to Canada, cannot generally find the means to pay for his own passage, and for that of his, wife if he have one; and if he go without a wife, he may remain single for years, in consequence of the small proportion of females in that colony. But to South Australia, the young workman may emigrate cost free; and he will obtain a free passage the more readily if he have a young wife."—p. 115.

Not a whisper here of "slavery,"—not a word of the scheme of "*preventing* the labourer from becoming a landowner," and so cutting off that "hope" which, we are truly told, is his "chief motive for emigrating"! No! no!—*this* passage is for *his* eye, and he must be content to read it by itself alone, and refrain from turning backwards or forwards to those in which the capitalists are attracted to the colony by the delightful prospect of reaping the profits of his forced labour! Truly, the compilers of this precious volume must have had a very comfortable opinion either of the self-denial or the mental blindness of their readers of the labouring classes.

How pleasantly do they wend their way among the apparently insurmountable difficulties of their object! "Though hired labour will be constant, the persons composing it will be frequently changed,—the young men taken out will *soon* buy land with the savings from their wages." No doubt! In fact, one of the staunchest supporters of the scheme (Colonel Torrens) clenches the matter by telling us the precise time it will take for the labourer to transform himself into a landowner. "In new colonies labour is scarce, and wages are therefore high. The consequence will be, that, *in three years*, a labourer may save sufficient to take a farm to himself." And yet we charge such philanthropists as these with a design of entrapping their fellow-countrymen into slavery! If we do, it is on no other evidence than their own professions. Why, the whole purpose of their book is to demonstrate the evils that have resulted in those colonies where labourers can "*soon* buy land from the savings of their labour;"—the whole end and aim of their scheme is to est colony, in which a labourer "save sufficient to take a farm to in three years, or in ten. The tells us, that in new colonies scarce, and wages are *therefore* True!—but the very circumstanc is to distinguish South Australia other colonies whatever (exce colonies), and to make it the sium of the capitalist, is, that possess (vide our quotation fr 115) "PLENTY of labour," an "*therefore*" wages will be *low* does not promise well for the man's speedy attainment of dence, especially when coupled fact that the price of land is to and that if it be not high eno Commission of Public Lands such a price as shall—(do what the labourer into a farmer at one —such a price as shall prevent bourers taken out with the p money of new lands from b land-owners, until — the comm please. In plain terms, the wh sole business of the commission i sist in taking care that the labou not make his escape from "the m hired labour"—in keeping the co the capitalists of the colony, in a supply of "slavery;"—of "huma who can be prevented from o land." But there is consolation the poor emigrant. "If the land be sufficiently high, poor l will have the prospect of becom merely land-owners, but masters." good; but why should they emi all? The price of land is sure ciently high in England to s poor labourer the fatigue of t half the globe to find the same b —if high-priced land and low w to make every labourer a ge farmer in the new colony, what be his condition at home, where a hundred times dearer, and w their lowest? He must surely h prospect of becoming an inde yeoman, with men and maids at —not in three years, but in three Yet thousands, every year, aban enchanting prospect for the sak paltry "hope of obtaining land, any assistance in cultivating it," nada! All this is passing stran

ll for the success of the new co-
a lure for the labouring classes.

of the grand features of the new
that the due proportion between
bour, and capital, will always be
" because every purchase of
ll provide the means of bringing
bourers," the proceeds of the sale
being always to be applied in
the passage of labourers from
It is to the operation of this
e (and the projectors of the colony
er weary of sounding its praises)
e working man is to be indebted
scape—if he ever make it—from
arket of hired labour," since (we
Col. Torrens again) "the price
he pays for his land is to be em-
n bringing out fresh labourers to
him who has thus *withdrawn his*
from the market." It requires
ew words to show the fallacy of
ch-bepraised principle. The land
sold at such a price as will be
t to pay the passage from Eng-
the labourers required to culti-
It is proposed that it shall be
hillings per acre, which, at 15*l.*
rson, will take out four labourers
hundred acres. Now, let us sup-
settler paying his 60*l.*, and taking
n his four workmen. At the end
years (according to Col. Torrens's
ion), each of these will be able
a farm from his own savings;
money paid will be applied to
ut their successors. Now the
is, who is to have the labour
e successors? Supposing each
buy a farm of 25 acres, this, at
acre, will produce just enough to
ut one man, and just one man
required to cultivate it. But
to become of the original settler?
new "master" is to claim his
," *their* master will be left to till
for himself:—if the old settler
ve the four, the new ones will
id their cash for nothing, and
st as well have gone to Canada,
n content to "obtain land with-
stance in cultivating:"—and if
ur of the new-comers is to be
pen for the competition of both
he due proportion between land,
and capital, is at once destroyed,
h as, while there will now be
200 acres in cultivation, there will be only four "hired labourers"—just as many as there were before to one hundred—to cultivate them. Thus the grand principle destroys itself the very first moment it comes into operation.

In one word, the whole scheme is but a mass of fallacies; and the exposition of its advantages, in the volume before us, a mere crude bundle of contradictions, which it would be a waste of time and trouble to expose in detail, especially as even the cursory reader of *the whole book* will detect the majority of them. To sum up all the "new system" of securing plenty of labour (and consequently labour at a low rate) by compelling all land to be purchased, is the most egregious fallacy of the entire set. The concoctors of the scheme know very well what they have to contend with:—

"The difficulty lies in this; that without *some kind of slavery* the capitalist has no security for the repayment of his outlay; that the labourer, as soon as he reaches the colony, laughs at his engagement; that what the capitalist brings to the colony in the shape of labour, ceases to be labour the moment it reaches the colony; or, at all events, is never labour over which he who paid for it has any control.

"In Canada, universally, labouring servants, taken from England and Ireland by capitalists, under engagement to repay with labour the cost of their passage, have quitted those to whom they were bound, to work for others who, not having laid out money in that way, could afford to pay higher wages than those who had."—p. 114.

And what is to be the remedy for this disaster in South Australia? What is the kind of slavery to be adopted? What security is the capitalist to have for his outlay? Why—"the price of land will take out the labourers free of cost to their employer, and *enable him to retain their services*," by preventing them, of course, from becoming land-owners, and consequently keeping them in the "market of hired labour." This, indeed, would be no great hardship, were they only so kept until their labour had repaid the cost of their passage. But we have seen that it is the aim of the founders of the colony to supply the capitalists with "constant and combined labour, with which to em-

ploy large masses of capital in raising a produce cheap enough for distant markets;" and that, in order to this, the labourer is to be kept "in the market" at the arbitrary will of a Land Commission sitting in England, and just so long—whether only seven years or a whole lifetime—as they may think expedient! Such is the idea, at any rate, of the authors of this new system, and, fortunately it is a highly absurd and impracticable one! The price-raising fiat of the commissioners, instead of keeping the working men who had saved a little money—with the intention of "becoming landowners"—in the "labour-market," would only be the signal for their setting sail for New South Wales or Van Diemen's Land, or even Swan River itself (the constant theme of ridicule to our learned Thebans of South Australia);—to any attainable spot, in fact, where the authorities have not taken so much pains to "hinder the settlers from immediately becoming, all of them, owners of land," as in the new Paradise of "Capital," whose attractions were to be so irresistible.

Strangely enough, the circumstance of the dangers resulting from the near neighbourhood of such *badly-conducted* colonies as those referred to, appear to be totally overlooked. No provision is made for the very probable circumstance that, should the rate of wages be higher in Van Diemen's Land than the new colony (as the projector of the latter intend it always shall be), the labourer, who has already undergone the voyage of four or five months from "home," for the sake of bettering his condition, will hazard that of five or six days to Hobart Town, to improve it still further. The "kind of slave" is to be so supernaturally stupid, that he is to remain in his "kind of slavery" with the means of his deliverance always staring him in the face! We are told that Bass's Strait, instead of being a barrier against, is, in fact, a means of closer connexion with Tasmania, and it is anticipated that the communication between the two colonies will be rapid and constant. In such a state of things, it will be the most natural thing in the world for the labouring emigrant, if he can scrape together any money at all, to re-emigrate across the Strait, and leave a colony where made artificially scarce, and labo ficially abundant, for another in his only commodity—labour—greater request, and the means o dependence—land—to be had o terms.

From the first broaching of the for this colony, we have been a on the watch to observe what would be proposed to chain the l to the soil—what strong measur to be resorted to, to keep him wi power of the capitalist who is t him. We can find none:—the business is to be effected by t simple method of calling his p money to the colony the "price land" he is to cultivate. As fa plan is developed, there would ap be no restraint upon the actions man brought out with the "price land." The capitalist is to "re services" only because, as he has ney, and land is not to be had it, he must needs labour for his ence. We do not hear that he prevented from working for wh pleases, whether his original ma no; we are not shown by what m is to be made a fixture at South lia, or how he is to be stopt from " himself off" by the first opportuni his arrival. The new colony seen considered by its projectors as a beetle-trap:—when once they hav the labourer in, it is not *in natura* that he should ever get out again

This is a capital blunder—al much of a piece with the rest of t cern—and sets the mind quite at the "slavery" score. Should th ever be carried into effect, we ne be afraid that South Australia wi become a rich exporting colony labour of its white negroes: it wi be a very handy establishment fo Diemen's Land and New South W

It is extremely improbable, ho that the affair will be carried into tion at all. It is hard to say by the colony is to be established. G ment has nothing to do with it "The South Australian Associati merely a society of amateurs in co tion, *friends* to the scheme only, an

as most people have naturally supposed, a body of shareholders, or persons otherwise closely interested. As soon as the thing is set agoing, these gentlemen intend to retire, and leave it to "go on" of itself! They do not advance one farthing towards the establishment of the colony! The funds for that purpose are, it would appear, to be derived from *anticipatory* sales of land, and from two loans which the commissioners are empowered to raise (if they can), one of indefinite amount on the security of the colonial lands; and the other limited to 200,000*l.* on security worse even than that of uncleared and uninhabited lands—the security of the yet-uncollected *revenue* of the yet-to-be-established colony,—on the *taxes* to be gathered from a territory which does not *at present* pay one farthing to either excise or customs,—simply because there is not a single individual within its bounds either to pay or to receive! Brilliant security this; the Poyais loan was hardly a more inviting speculation!

Although the Act of Parliament for the establishment of South Australia has been for some time passed, it does not appear that much has been done to forward its objects. The South Australian Association has had a public meeting on the subject, and more than that, has given a public dinner to its chairman, as a tribute to his transcendent services in the cause!! But we hear of no embarkation of settlers—of no liberal *subscriptions to the loan* on the part of the wealthy members of the Association—of no greater exhibition of zeal in the cause than the mouthing of a silly speech at Exeter-hall, or the plying of an active knife and fork at the Crown and Anchor; and, unfortunately, it is not by speechifying, or eating and drinking, that the active business of forming a new colony, on a "new principle," is to be got through. There must be more "stirring work" than this; and, as nobody seems to have undertaken it, and South Australian Bonds are probably low in the market, it is by no means unlikely that the concern may die a natural death, in spite of all its skilful doctors. There is, whether this may be the case or no, one party to whom the affair has been a deep disgrace—the British Government, by whose acquiescence a vast extent of the territory of New Holland, including a long range of its coast—and, as it may happen, the most important portion of it—has been placed at the disposal of a set of nameless adventurers, in order that they may try a rash and ridiculous experiment, without risk or expense to themselves!

LIST OF NEW PATENTS, GRANTED BETWEEN THE 22D OF SEPTEMBER AND THE 23D OF OCTOBER, 1834.

Cornelius Tongue, of Gatacre-park, in the county of Salop, Esq., for certain improvements in apparatus for preventing accidents to travelling carriages of various descriptions. September 25; six months to specify.

Jean Baptiste Mollerat, now residing with Sir John Byerley, at Whiteheads-grove, Chelsea, manufacturing chemist, for certain improvements in the manufacture of gas for illumination. Sept. 25; six months to specify.

Richard Witty, of Hanley, Staffordshire, civil engineer, for an improvement or improvements in saving fuel and burning smoke, applicable to furnaces and stoves. Sept. 25; six months to specify

Samuel Draper, of Radford, Nottinghamshire, lace-maker, for an improved manufacture of figured bobbin net, or what is commonly called bobbinnet lace. Sept. 25; six months to specify.

James Gardner, of Banbury, Oxfordshire, ironmonger, for certain improvements on machines for cutting Swedish and other turnips, mangel wurzel, and other roots used as food for sheep, horned cattle, and other animals. Sept. 25; six months to specify.

Joseph Chisill Daniell, of Tiverton-mills, near Bath, clothier, for an improvement or improvements in the process of manufacturing or preparing woollen cloth. Sept. 25; six months to specify.

Richard Freen Martin, of Hercules-buildings, Lambeth, Gent., for a certain process or processes, method or methods, of combining various materials so as to form stuccoes, plaisters, or cements, and for the manufacture of artificial stones, marbles, and other like substances used in buildings, decorations, or similar purposes. Oct. 8; six months to specify.

James Jamieson Cordes, of Idol-lane, London, merchant, for certain improvement or improvements in machinery for making nails, being a communication from a foreigner residing abroad. Oct. 8; six months to specify.

James Jamieson Cordes, of Idol-lane, London, merchant, for certain improvement or improvements in machinery for making rivets and screw blanks or bolts, being a communication from a foreigner residing abroad. Oct. 8; six months to specify.

Benjamin Hick, of Bolton-le-moors, Lancashire, engineer, for certain improvements in locomotive steam-carriages, parts of which improvements are applicable to ordinary carriages and to steam-engines employed for other uses. Oct. 8; six months to specify.

Thomas Sharp, of Manchester, and Richard Roberts, of the same place, engineers, for certain improvements in machinery for spinning and doubling cotton, silk, flax, and other fibrous materials, being a communication from a foreigner residing abroad. Oct. 8; six months to specify.

John Ericsson, of Union-wharf, Albany-street, Regent's-park, engineer, for certain improved machinery applicable for propelling vessels. Oct. 10; six months to specify.

George Richards Elkington, of Birmingham, optician, for an improvement or improvements in the constructing, making, or manufacturing, of spectacles. Oct. 10; six months to specify.

Thomas Searle, of Coleman-street, London, merchant, for certain improvements in boilers for generating steam, being a communication from a foreigner residing abroad. Oct. 11; six months to specify.

Lord Baron Audley (so styled in the patent), of Releigh Castle, in the county of Stafford, for an apparatus or machine as a substitute for or to be attached to locks or other fastenings, which he denominates a lock protector. Oct. 11; six months to specify.

Samuel Seward, of All Saints, Poplar, engineer, for certain improvements in the construction of steam-engines. Oct. 17; two months to specify.

Claude Marie Hilaire Molinard, of Brewer-street, Golden-square, merchant, for a certain improvement in looms, or machinery for weaving fabrics, being a communication from a foreigner residing abroad. Oct. 17; six months to specify.

George Littlewort, of Rabere-street, Goswell-road, in the county of Middlesex, watch and clock-maker, for certain improvements on watches and clocks. Oct. 17; six months to specify.

Malcolm M'Gregor, of Manchester, manufacturer, for certain improvements in machinery for slubbing, roving, twisting, and doubling cotton, and other fibrous materials. Oct. 20; six months to specify.

James Jones, of Salford, Manchester, machine-maker, for certain improvements for making rovings, spinning and doubling of cotton, silk, flax, and other fibrous substances. Oct. 20; six months to specify.

Manoah Bower, of Birmingham, manufacturer, and George Blyth, of the same place, merchant, for certain improvements on or addition to saddles for horses. Oct. 22; six months to specify.

Jean Baptiste Pleney, of Panton-square, Middlesex, brickmaker, for certain improved machinery for manufacturing articles out of brick and other the like earth, being a communication from a foreigner residing abroad. Oct. 22; six months to specify.

James and John Hartley, of West Bromwich, near Birmingham, glass-manufacturers, for a certain improvement or certain improvements in the manufacture of glass. Oct. 22; six months to specify.

John Stanley and John Walmsley, both of Manchester, mechanics, for certain improvements on grates, or apparatus applicable to steam-engines or other purposes, and in apparatus for feeding the same with fuel, which apparatus, conjointly or separately, may be applied to other purposes. Oct. 22; six months to specify.

Amasa Stone, of Johnstone, in the county of Providence, and State of Rhode Island, in the United States of America, machinist, now residing at Liverpool, for an improvement on power and other looms, and in the weaving of silk, hempen, cotton, woollen, and other cloths. Oct. 23; six months to specify.

George Daniel Carey, of Basford, in the county of Nottingham, hat-manufacturer, for certain machinery or apparatus to be employed in the manufacture of hats. Oct. 23; six months to specify.

NOTES AND NOTICES.

Cheap Almanacs have become, since the abolition of the stamp-duty on this class of publications, wonderously numerous; but they are mostly of such a quality as to be dear at any price. The getters-up of these things seem to imagine that nothing more is requisite to the production of a good calendar than to make a good use of paste and scissors; all *computation* they must certainly hold to be superfluous, for they have rushed into the market *without taking time for any*—not even a day or two to save appearances. We have looked into a great many of these dear bargains, but have not met with one which is not in some respect or other grossly erroneous. For instance, in what is called, *par excellence*, "The People's Almanac," the moon's risings and settings are in error from 12 to 13 hours *every day throughout the whole year*; and the same is the case with two others (from the same paste and scissors shop, probably); in a fourth, the first *Sunday* in Lent is made to fall on a *Saturday;* and in a fifth, you are presented with a marketing-table, from which you learn that, if you wish to ascertain how many shillings there are in 45 halfpence, you have only to divide by 12, an error of about 50 per cent. merely! We have little doubt that, were it worth while, we could collect, from the already published Almanacs for 1835, more blunders than could be gleaned from all the old Almanacs for a century past.

Philo-Sweep, in furtherance of his humane purpose, would do well to send a note to Glass, the machine-maker (No. 2, Moor lane, Cripplegate), who will attend him in any part of the town, however distant. Philo-Sweep ought, above all things, to avoid employing any chimney-sweeper who keeps a climbing-boy to use the machine.

The communication of A Welchman shall have a place soon.

Answers to numerous inquiries in our next.

Communications received from Mr. Lamb—Myrrha—A. B. (Bristol)—Lambda—Mr. X. Willes—A Possessor of the Magazine from its origin—A Subscriber (Rugby)—H. Watson—Mr. Sopwith.

The Supplement to the present Volume, with Contents, Titles, and Index, and Portrait, on Steel, of the late Mr. Telford, will be published on the 1st of November.

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o. 586. FRIDAY, OCTOBER 31 (FOR NOVEMBER 1), 1834. Price 6d.

THE PORTLAND BREAKWATER.

Fig. 2.

Fig. 1.

PORTLAND BREAKWATER.

Sir,—My attention was, a few days ago, drawn by a friend, for the first time, to an article in the Mechanics' Magazine of Saturday, May the 20th, 1830, communicated to you by Mr. Harvey, of Weymouth, on the subject of a breakwater in Portland Roads, in which he claims for his father some merit for being the first person to suggest the work. It is impossible for me to say that Mr. Harvey, sen., had not thought of, and even proposed, such a work, prior to 1812; but this I can assert with truth, that if he, or any other person, ever suggested such a work prior to that time, it had not come to my knowledge when, in that year, I brought a plan of my own for the purpose, in a very prominent manner, before the public, without my claims to originality in regard to it being ever disputed, either by Mr. Harvey, sen., or by any one else.

I cannot carry my own suggestion further back than Mr. Idle's election for Weymouth, in 1812. Mr. Idle had, on the occasion of his election, been applied to to assist the town in repairing a small pier at North Point, originally built by one of their members, for the protection of the mouth of the Wey, but at that time in a state of dilapidation. We had one day ridden over to Portland, and were sitting on our horses, on the highest part of the island, when, reminded, probably, of the application by seeing North Point, Mr. Idle mentioned the subject to me, and asked, whether he should give the money, which he understood would be about 3,000*l.*? I said no, because it would, comparatively speaking, be throwing it away; "but," added I, "if you wish to benefit Weymouth, do that which will benefit the country also—have a breakwater, such as is now forming at Plymouth, run out from this point into the Bay, to where the Abergavenny lies, and then the people of Weymouth will not want a pier at North Point." Mr. Idle laughed at what he ironically called my magnificent ideas, and the matter dropped. The observation, however, was not forgotten; and Mr. Idle, on his return to London, consulted Mr. Sam. Watkins, an experienced seaman, and an old and faithful servant of his house. Mr. Watkins *approved of* the suggestion, and, between Mr. Idle's election and t of August, 1813, we had mar sions on the subject; and Mr well as myself, read with atte Report of the Select Committ House of Commons on the ments in Cutwater, printed i Gen. Bentham's Minute of th Sept., 1811, to the Navy Boa Pier and Breakwater in Plymou —Papers relating to Plymout ordered by the House of Comm printed the 12th and 19th Feb Two Letters from Captain Peal Gambier, on the subject of th water, in March 1812—and Mr Report of the 22d Aug. 1812, with his letter on the subject Liverpool, published in Novemb besides the debates in Parliam all that appeared on the subje periodicals of the day. Mr. I ing the situation for, and the pl breakwater which I had sugg him, free from all the objections been urged against the propose Plymouth Sound (all of whi since been found to be groundless I would take such steps as I necessary to ascertain the prac of its construction; of its utility son was a better judge than him

The first step I took was an tion to Mr. Dessiou, the hydro a scientific as well as an exp practical seaman, and intima quainted with the channel nav from whom, on the 20th of Augu I received the following letter:—

Albion-street, Aug. 2

Sir,—In reply to your favour of y in which you request that I will, fo formation of Mr. Idle, communica what I know respecting Weymou and the roadstead between Portl Lulworth Cove, such as the depth set of the tide, and all other infor was in possession of useful, in co the practicability and utility of b pier on such a scale as may rer national object—

I have to inform you, that the b Portland Road is good holding grou that a large fleet may ride there with a westerly or northerly wind; not advisable for any vessel to rem with the wind between the E. and because, with the wind at S. S. E., a dead wind on the shore all the way

down the English Channel, it is bad riding, and impossible to get out with a fleet.

It is high water about six o'clock, on the new and full moon, in Weymouth Harbour, where the tide rises 8 feet, or nearly so, perpendicular. The eastern stream runs until a quarter past nine o'clock at the Bill of Portland, in the direction from the Race over the Shambles for St. Alban's Head, at a great rate, which causes an eddy in Portland Road; the western stream or tide sets the reverse of that of the eastern, and some part of it sets round the shore to Portland Bill, from whence it sets to the S. W.

I cannot state, with certainty, the depth of the water at the anchoring place in Portland Road; and I am totally unacquainted with it in Portland Bay, Weymouth Bay, and on the north shore; neither do I know of any chart that has them sufficiently correct to be depended upon.

From the present state of Portland Road, it is calculated for an anchorage only for such ships as are wind-bound, and bound down channel; but from the exposed situation it is a place of considerable danger.

Should a pier or breakwater be erected in the north-east direction, it should be built from the north-east end of the Isle of Portland, where the necessary materials are to be obtained; and if a lighthouse be built on the north-east end of the pier, it may be safely approached at all times, and when vessels are once within it they will ride secure from all winds: with these advantages, vessels, bound down channel (having laid there wind-bound, or otherwise), may at any hour, when there is a fair wind, weigh anchor, and get out by night or by day, as there is no tide to hinder them, and the lighthouse will be a leading mark to sail between the Shambles, the Island, and the Race.

Should there be an enemy's fleet lying at Cherbourg, which lies nearly south by compass from Portland Harbour 62 miles, there would be a greater chance for an English fleet meeting with the enemy, when they sail from Cherbourg, by lying at anchor in this harbour (with small vessels on the look out), than if our squadron were cruising before the port of Cherbourg. For the enemy would naturally wait for an opportunity, when a strong gale of westerly or southerly winds should have drove the blockading squadron off their station, either up the channel, or into St. Helens Road; there, on the shift of the wind, the enemy would sail immediately.

Should the blockading squadron have taken refuge at St. Helens, when the wind comes fair for the enemy to sail from Cherbourg, the *squadron must take* a particular time of tide to get out of St. Helens (from whence Cherbourg bears nearly W. ¼ W. 65 miles), and by the time the English squadron get off Cherbourg, the enemy's fleet may be so far down channel as not to be overtaken; whereas, should the blockading squadron remain at anchor in Portland Harbour, the ships might always be kept completely victualled and watered, have less wear and tear, be ready to sail at any time, and are farther down channel than Cherbourg. Should a ship or a fleet be bound up the channel, be taken with a gale of wind to the north-east or eastward, and not be able to get the Needles' passage, they would be obliged to bear up either for Dartmouth, Plymouth, or Falmouth, or lay to, and drive down the Channel; but if a pier or breakwater was built at Portland, they would of course put in there. With a pier or breakwater at Portland, the advantage to the port of Weymouth and Portland would be incalculable, as they might then load their vessels with Portland stone, with any wind; and as they are now confined to the size of their vessels, for the want of more water in Weymouth Harbour, they might then have what sized vessels they please, and carry on not only the coasting but any foreign trade they please.

Should Government think it advisable to lay moorings down within the pier or breakwater, ships riding there, with the moorings taken in at the Starboard Briddle Port, when ordered to sail, would cant to port, be under sail in a quarter of an hour, and fetch out in one tack, even with a south-east wind by night or by day.

I am, Sir, yours, &c.

JOSEPH DESSIOU.

To Alexander Lamb, Esq.

Mr. Dessiou's letter was submitted by Mr. Idle to Capt. Bowen, one of the witnesses examined on the projected improvements at Plymouth, then residing at Tunbridge Wells, and he not only confirmed all that Mr. Dessiou had stated, but made many encouraging observations, adding, that he well remembered a night when he believed every officer on board the channel fleet would have given all they were worth in the world to have had Portland Roads a harbour for that night only.

On the 29th of August, 1813, I sent down Mr. Geo. Dodd, the civil engineer, to Weymouth, with a letter of introduction from Mr. Idle to Mr. Henning, the banker; and in consequence of Mr. Dodd's favourable opinion of the under-

taking, Mr. Henning had a meeting on the 8th of Sept. with several of the most influential quarrymen, from whom he ascertained there would be no difficulty in procuring material and labour abundantly sufficient for the completion of the work.

I may, I hope, be excused for mentioning, in this place, that many of Mr. Idle's and my own friends knew that he was in the habit of consulting me, and occasionally acting on my advice; and amongst those who were aware of this fact, was the late Mr. Abraham Bracebridge, who, shortly after Mr. Idle's election, applied to me to use my influence with him in favour of a plan of Mr. John Harvey for converting Lulworth Cove into a harbour; I explained to Mr. Bracebridge that there was a much more important plan in contemplation; and, when Mr. Dodd was going down, he took letters of introduction from Mr. Bracebridge to Mr. Harvey, who gave Mr. Dodd all the information he was in possession of, or could procure for him.

In the meanwhile, I published, in the *London Gazette* and the principal provincial papers of the West of England, a formal notice of its being intended, in the then ensuing session of Parliament, to apply for an Act for "Constructing a Pier or Breakwater and forming a Harbour in Portland Roads, for the reception, shelter, and security of his Majesty's ships of the line, and all other vessels, by erecting the said Pier from or near the North-east end of the Peninsula or Island, &c." I send herewith, in evidence of this, copies of the *London Gazette* of Sept. 11 and 14, 1813, and *Western Flying Post* of 13th Sept. 1813.

Mr. Dodd having completed his survey, and lodged the necessary plans and sections with the Clerk of the Peace, returned to London, and Mr. Bracebridge received from Mr. Harvey the following letter:—

Weymouth, Sept. 30, 1813.

Sir,—I was prevented the pleasure of writing, by favour of Mr. Dodd, not being certain of the time of his departure.

I have attended him, and rendered such assistance as he required and wished for, and from the best judgment I can form at the present moment, I have no doubt whatever but his survey and representation will *be such as to give a high* satisfaction to you and all the gentlemen concerned in this grand undertaking. Its practicability cannot be for a moment doubted; and the resource for stone, with facilities in conveyance, cannot I think be surpassed, if equalled in the world.

I doubt not but a quantity of stone, sufficient for this undertaking, will be found below the cliffs, which has been thrown away for ages past as waste; if more was wanting, an inexhaustible store of the same description lays above the intended railroad.

The more I investigate the more I approve, and so must, I think, every person that visits Portland, and looks it over.

I am using my best endeavours to make calculations, and complete drawings of the work, &c., which shall be at your service whenever you wish it; and beg leave to assure you, that I have made up my mind to go most heartily into the concern whenever your friends may please to give an intimation to your obliged and

Devoted humble servant,

JOHN HARVEY.

To Abraham Bracebridge, Esq., No. 3, Bridge-court, Westminster, London.

On the 11th of October, Mr. Idle received from Mr. Watkins the following letter:—

London, October 11, 1813.

Sir,—Portland Bay appears to me to be the only place in the British Channel, from Spithead to Plymouth, capable of being made a good harbour for men-of-war and merchant-ships. Its advantages are many: 1st. Its shelter for cruisers, particularly so, should it be necessary at any time to watch or blockade Cherbourg. 2d. The bottom is all good holding ground, being blue clay, and the Bay is quite clear of rocks and shoals. 3d. There is little or no stream of tide in it, as it is mostly eddy. 4th. It is an excellent outlet for ships bound up channel or to the North Sea. 5th. It will also be an easy outlet down channel, as ships will mostly fetch out in two tacks—what cannot be said by any other port in the British Channel, with the wind blowing in.

The mole or pier proposed to be made in Portland Roads (if accomplished so as to make smooth water there), will be of great national advantage for the above reasons; and also that ships will be able to ride there safe with any wind; now they can only be there with a westerly and northerly wind, and even then in constant fear of a sudden shift to the southward or eastward, as with either, if it blew strong, ships could not get out, and of course would be in danger of going on shore.

Had there been a good harbour at Portland, the following dreadful disasters might have been prevented: viz.—The great loss sustained by Admiral Christian's fleet in the year, and the ruin of the expedition he was then going on—The loss of the Abergavenny, and the loss of the Halswell East Indiaman, with, no doubt, many others. The advantages of the above mole or pier in Portland Roads appear to me to be as follows:—

1st. Ships sailing from Plymouth with the wind at S.E. by S., must work out at least 5 miles, and then they cannot clear the Lizzard Point, as the western stream will draw them into the Bay for three hours after low water.

2d. Coming out of Portland with the same wind, you have to work 4 miles out, and then you fetch 21 miles to the southward or windward of the Rainhead of Plymouth, and can continue your course down the channel, if you wish.

3d. Ships bound westward are expected to sail from any port in the British Channel with the wind at S.E.; therefore ships sailing from Plymouth with this wind will fetch within 49 miles of Ushant; ships sailing from Portland will fetch within 11 miles of Ushant.

4th. Ships cruising off Cherbourg could put into Portland, victual and water in one day, when it would take them several days to go to Spithead or Plymouth, allowing they had fair winds there and back.

5th. Ships can sail from Portland with the wind at S. S. W. for any port up channel or the North Sea; with the same wind at Plymouth they must work out at least 12 miles, before they can stand to the eastward, but should the wind blow strong they cannot get out of Plymouth at all, not even with the wind at S.W. It also takes a whole tide to work out of Plymouth, and then the stream runs to the westward for three hours against them. Ships could work out of Portland at any time of tide, but with the above wind they could sail out by day or night.

6th. Ships watching off Cherbourg, should the wind blow easterly, must run for Plymouth, and they cannot return with that wind; should it shift to the westward, say S.W., and blow strong, they cannot get out of Plymouth to return to their station; at same time they could have run for Portland with an easterly wind, and return to their station as soon as the wind moderated; and they could also return from thence with the wind at S.W.

7th. Watching the same port with a strong wind westerly, you can run for Portland, and come back with the same wind to your station with pleasure. *You can also run for Spithead, but cannot return with the same wind; and when the wind shifts* to the eastward, should the tides fall out late and early, you cannot get off Cherbourg in less than 24 hours; when from Portland you can run over in 6 hours, athwart your enemies' bows (if they are out), instead of chasing after them from Spithead some hours' sail astern.

8th. When your ships are blown off their station, and forced to Plymouth or Spithead, the ships in Cherbourg can put to sea, for up or down channel, and be out of your reach before you have intelligence of them.

9th. It will take a much longer time to communicate with Plymouth or Spithead than with Portland, should an enemy's fleet be preparing to come out; and with an easterly wind you cannot communicate with Spithead at all; with a westerly wind you cannot communicate with Plymouth, but with either you can with Portland.

10th. Cruisers will maintain their station much longer in gales of wind, when they know they have a safe harbour to run to by day or night, which is of great importance, as in that time of perseverance the wind may abate, and the ships not leave their stations at all.

11th. Ships running out of Portland to the westward have a good channel between that isle and the Shambles, about 1½ mile wide, and from 6 to 12 fathoms deep. Fleets of men-of-war and merchantmen have passed this channel.

12th. Ships bound down channel, catched in a western gale, run for the Isle of Wight; night coming on, strangers would be obliged to bring to; before morning they drift by, after which they must run for the Downs; these ships would have been off Portland by day-light, and could have been in had there been a harbour.

13th. Many ships have also been off Dunnose, catched in a gale of wind to the eastward, and obliged to run for Plymouth, when a sudden shift to the S.W., blowing strong, kept them there; they could not return till it was moderate; had they a safe harbour at Portland, they could have been in and out soon as the wind shifted.

14th. The French have, of course, built their pier at Cherbourg to annoy our channel fleet, should they ever have it in their power; and suppose they had 30 sail of the line in the above port, and we had 20 sail in Plymouth, and 20 sail in Portsmouth, they could not join, and the French would be able to beat or disable either at their will; in fact, they might be said to blockade these fleets lying in their own harbour.

The foregoing articles are all subject to revision, as they have been gone over rather hastily, but I have consulted Mr. Dessiou on the whole, and have his entire approbation

of the particulars; indeed, we have spent some hours together since you left town.

I am Sir,

Your most obedient servant,

SAM. WATKINS.

To Chr. Idle, Esq., M.P.

Mr. Idle also received shortly afterwards the following report from Mr. Dodd:—

Newington, October 12, 1813.

Sir,—On the 29th ult. I proceeded to Weymouth to ascertain the practicability, utility, and expense of the proposed reef or breakwater, from the north-east extremity of the Isle of Portland, and thorough investigation affords me the pleasure of reporting that the intended undertaking is in all respects practicable. The situation is highly favourable by nature, and the work itself will be facilitated by fortuitous facts relative to the stone, of extraordinary novelty, and equal worth.

The foundation is good, being a hard bluish clay, on which the stones will not slip or move, but slightly bed themselves, and remain for ever stationary.

The depth of water averages 8½ fathoms at the *highest* tides, including 8½ feet the rise of the tide. This depth is less than exists in a similar undertaking. The dyke or mole of Cherbourg, which was formed in 10 fathoms water low spring tides, and which tide rises there 6 fathoms; to which height the French have not only erected the work, but also to 5 fathoms more, making the total elevation 21 fathoms. This exceeds the proposed reef or breakwater by 12½ fathoms. The Portland Breakwater will be about 1½ fathoms less deep than that in Plymouth Sound at *high water;* and while Plymouth only accommodates 36 ships of the line, Portland harbour will give equal berth and room to 60 sail of the line, besides a far more extensive and sheltered space in the wake of the breakwater for frigates and whole convoys.

In reference to the above 60 sail of the line, it should be observed, that not less than 5 fathoms low water is allowed to each vessel; while it appears that, by the plans and papers printed by order of the House of Commons, relative to Plymouth Sound, that no more than 4¾ is in some instances afforded there to ships of the line; yet much of the anchorage ground for these ships in Portland proposed harbour will exceed 9 fathoms.

Here there is no danger of ships "striking *on their own anchors,*" or those of "ships *lying near them,*" "*in the event of driving,*" or "*in the act of unmooring;*" neither will it be possible for "large men of war" ever "to strike on the bottom," or "drag their moorings." The surface, sheltered by the breakwater of Plymouth, is about 1¾ superficial miles; but the proposed Portland Harbour will contain a tranquillised sheet of water of full 4 miles area.

The tide in Plymouth Sound rises 18 feet, and runs 1½ knots per hour; but in Portland Roads it only rises 8 feet, and never runs strong; owing to the embayed position of the place the tide forms an eddy; hence it is generally said by seamen to have no velocity of tide, though in reality it has some, but not worthy of notice. Thus neither rapidity or altitude of tide equal the difficulties that in other instances ourselves, or our enemies, have surmounted.

The local facilities that promote the execution of this great work next claim attention.

The stone is ready quarried, and laying in many millions of tons within one mile of the proposed breakwater. Favourable localities do not end here; the required stone lays at such an altitude, that the descending laden waggons will draw up the empty or light ones, and human or horse labour need scarce be exerted. It may be had in dimensions far greater than requisite, and the abundance is such as to admit the utmost latitude of choice. Stone has been wrought in, and transported from, the Isle of Portland for about 200 years. The number of quarry-men at present employed exceed 450. The quarries are in general placed at least 250 to 300 feet above and very close to the sea-shore.

The most advisable mode of constructing the proposed breakwater, is by large stones, cautiously placed in the sea-line of deposition, being directed by marks and mooring chains previously and correctly situated, and superintended by a skilful person, who will point out to each vessel its particular spot for each unloading. This chiefly relates to the casing of the breakwater, for the interior of which stone of a less dimension will be adequate. None, even in the casing, need be larger than 1½ to 2 tons, yet, as stated before, they may be had in any quantity, and of any dimensions.

A breakwater of 2 miles long will be fully sufficient to shelter his Majesty's fleet, and the largest convoys that ever assembled on the coast. It does not occur as requisite to form a cut-stone pier along the breakwater in the first instance; but a lighthouse, at the north-east end, will be useful. As the work proceeds the efficiency of its protection will be ascertained; at present I am of opinion, that 1½ miles is the utmost length to which it need be extended.

By deflecting the last quarter of a mile of

kwater, as represented on the plan, d, swell, or waves, during a south- id, will be materially reverberated, or off, and thereby more fully protect ance of the harbour.

stimate is subjoined. The facilities ining to the stone have naturally and lly reduced the total expense which (considering the magnitude of the otherwise appear deficient. The cal- ı of quantity is formed on slopes and qual to the breakwater at Plymouth admirable and well-executed work ady produced beneficial effects), and than I have seen allowed in very an- ı-mounds or dykes in Holland. Some ns may take place during the pro- the work, yet it is right to allow to ost in the first estimate.

es not appear possible, that the break- ill ever have within it a decreased There are not any rivers, as at Ply- or Cherbourg, to deposit their silt or it; and when the tide runs out of the of Weymouth, it will be at the same *ming out* of the new harbour of Port- herefore the sediment of the Wey, as it is, cannot *run into it*; as the vel will always be near the mouth of rbour.

Fleet, or little armlet of the sea, that s between the Main and Chesil Bank, igues on the ebb very little more than es on the flood; and the little it does ıte, when the new harbour is made, ur the north shore and have a good

e confluent waters having a narrowed to pass through near the entrance of harbour, it may in time be some- epened, but cannot be lessened.

imited compass of this paper compels lose these remarks, and proceed briefly ess my sentiments of the utility of at work.

French rightly observing that Eng- ıs no intermediate harbour between th and Spithead for her navy, have nade an artificial one for themselves, opposite Portland, and nearly mid- ween the above harbours. They have cted the dyke or mole of Cherbourg, nmense expense, for the reception and of their navy. Hence it becomes e political interest of Great Britain ıte a harbour, that may counter- designs and capabilities of the enemy: purpose, Portland Roads naturally themselves, when nature has done all that is required, and aided by the ıtances mentioned of the stone, the ing hand of Englishmen alone is to improve and turn *these blessings own benefit and protection.*

A national harbour in Portland Roads will effectually counteract all mischief from the enemy. The distance is so moderate between Cherbourg and Portland, that, generally, signals of the course of the enemy may be received in half an hour. Whenever an enemy's fleet leaves Cherbourg, they must stand considerably out into the channel; and the British fleet would rarely, if ever, be more than two or three hours astern of the enemy. The south-east and easterly winds are those that render Portland Roads at present an insecure anchorage; a breakwater extending to the north-east, as laid down in the plan, will be an effectual shelter—ships may then run into the harbour, or get out to sea, *at all times* of tide, and *with all winds*, when they can carry sail. Here the narrowest entrance channel is nearly two miles, but the *broadest* at Plymouth will be only half a mile. At Portland the holding ground is the *best possible*, being a hard clay. Here there is no under swell or recoil of the waves from the shore; ships at anchor will ride end on and steadily; the nearest *lee-shore will be about two miles from the end of the breakwater.*

I prefer the breakwater to unite to the island rather than be in any other situation —the accommodation will be greatest, and the expense least. Portland Harbour has not "shovel," "tinker," or "panther" rocks, in mid-channel, or *any where*, like Plymouth Sound; but all is clear, deep, open, and extensive, presenting the largest and most safe artificial harbour in Europe; greatly exceeding Cherbourg, and the recent harbours made at Averio, in Portugal, and still more so that of Ramsgate, which does not admit ships of war, although it has cost more than the suggested national harbour of Portland will cost.

At this time Weymouth Harbour cannot receive large ships; even their colliers are obliged partly to unload in the Roads, where they are much exposed, and the expense is great.

The neighbourhood offers ample sites for docks, and every accommodation that the navy or army may in future require, with water and provisions abundant and cheap. Not only the commerce of Weymouth, and the trade of Portland, but the coasting trade in general, and the East and West India trade in particular, will be much benefited by this great improvement. The most intelligent maritime inhabitants assure me, that had this breakwater existed, the Abergavenny and Halswell East Indiamen and crews would not have been lost; and the greater part of Admiral Christian's fleet and the army would have been saved. To say nothing of the valuable lives that perished, the property of and in the Abergavenny alone, was equal to the whole cost of this political as well as humane improvement.

Viewing the Isle of Portland for a military station, it possesses all that science can desire of nature to give. It is prominent in the channel, and central to a long line of coast, and is probably the only place in England that, at a moderate expense, can be equally well fortified, and its guns would effectually cover the new harbour. Being united to the main by a very narrow isthmus, it has a fine military advantage.

This isthmus lays full 400 feet under the crest of the island, and within a short range of shot. The landing-places are few, and easily defensible.

As a depot for recruits, its utility is supposed to exceed the Isle of Wight, where the opportunities of desertion are numerous, and the great population of the place may tend to impede discipline.

It has been suggested, by an intelligent gentleman, that Portland is well calculated as a depot for prisoners of war. The recruits themselves would form a most useful, if not the major, part of the requisite garrison. To escape appears impossible, with the least preventive caution; and the smallness of the required garrison would leave many troops disposable that are now unavailable. The intended piers used in forming the work, will admit transports to lay them alongside, and thereby increase the rapidity, and decrease the expense of embarkations; while the facility of getting to sea from this harbour will enable troops to be readily sent to any part of the world.

I have the honour to be,

Sir, yours, &c.

(Signed) GEORGE DODD.

Estimate of the proposed Portland Reef or Breakwater.

To 3,500,000 tons of Portland or roach-rough stone, placed in the reef at 3s. 6d. per ton	612,500
To railways, waggons, and machinery, of every requisite description	20,000
To six stone shipping piers	7,200
To mooring chains, anchors, buoys, and stationary vessels	7,000
To a lighthouse at the north-east extremity of the reef	4,000
To contingencies 20 per cent. on the estimate	130,140
Estimate for 2 miles	£780,840
Ditto of only 1½ miles	£585,630

GEORGE DODD, Engineer.

Oct. 25, 1813.

After the receipt of these documents, Mr. Idle desired that I would take down Mr. Dessiou with me, and meet him at Weymouth. Mr. Dessiou and I accordingly proceeded to Weymouth, and on the following day Mr. Idle and Mr. Watkins arrived, accompanied by the late Mr. Rennie and Mr. Whidby, who were then engaged in the construction of the Plymouth Breakwater The two latter gentlemen having obtained from Mr. Watkins and Mr. Dessiou all the information they required respecting the bay, recommended Mr. Idle to proceed with the undertaking.

Mr. Dessiou proceeded to make a survey of Portland Roads and the opposite shore, and on the 9th of December I received from him the following letter:—

Alban-street, Dec. 9, 1813.

Sir,—I duly received your letter, communicating Mr. Idle's desire to be correctly informed respecting the depth of water on the north side of Weymouth Bay, the width and depth of the channel between the Shambles and Bill of Portland, the depth of water within the proposed harbour, together with its capability of containing any number of his Majesty's ships of the line, and requesting me to proceed thither, in order to procure the requisite information for Mr. Idle's Government.

Immediately on receiving these instructions, I proceeded to Weymouth; and on the 31st of October, Mr. George Dodd, the engineer, and Mr. Watkins, also arrived. On the ensuing day we commenced surveying Weymouth and Portland Roads, and the whole line of coast connected with the proposed breakwater. The next day (the weather being favourable) we continued our soundings on an extensive and accurate scale, which are delineated on the plan I have the honour herewith to transmit for Mr. Idle's information.

In my last communication to you, I stated I was not personally acquainted with the precise soundings; but now I am enabled to report that they are more than adequate for the reception of his Majesty's ships of the line, and vessels of all other descriptions: and, in my opinion, a breakwater 2 miles in length, will perfectly shelter and protect 60 ships of the line, besides numerous other smaller vessels.

I think the proposed harbour one of great national utility; and, from what I have locally observed, I am convinced that its completion will be attended with no difficulty.

When the breakwater is finished ships will not be liable to drive or drag their anchors, and, owing to the depth of water, never can strike on the anchors of other vessels near them.

Every ship will ride in safety in tempestuous weather, and may proceed to sea with all

winds, and at any time of tide, by night or day.

The fine, deep, and spacious bay on the north side, leading into the proposed harbour, without any one rock or shoal, are such favourable circumstances as do not exist in any other place in Great Britain; and the entrance being 1¾ miles broad, into a harbour of 4 miles surface, is no where equalled. Therefore, after my survey, and on a full and mature consideration of this subject, it is my opinion that the proposed harbour is practicable, and will be of essential service to his Majesty's navy, and the general shipping interest of the kingdom.

I cannot close this letter without apprising Mr. Idle of what you was in part a witness, of the very ready and able assistance I derived from Mr. Harvey, of the Library at Weymouth, who appears to have bestowed much thought and consideration on this subject, and who communicated much useful local information.

I am, Sir, yours, &c.

JOSH. DESSIOU.

To Alex. Lamb, Esq.

I am quite ready to admit, that as soon as the plan of the breakwater was opened to him, Mr. Harvey admitted its importance, and rendered both Mr. Dodd and Mr. Dessiou every assistance in his power, acting apparently up to the declarations he made to Mr. Bracebridge, in his letter of the 30th of September; but neither Mr. Harvey, Mr. Bracebridge, Mr. Dodd, Mr. Dessiou, or any one else, gave me reason to believe that Mr. Harvey had ever thought of a breakwater at Portland before Mr. Dodd's first visit to Weymouth in September, 1813. The subject appeared then quite new to every person at Weymouth; and, certainly, no practical steps had been taken towards carrying it into execution previous to that time, since which I have spared neither labour nor expense within my power, in order to make the subject understood, and the plan to be adopted.

Mr. Harvey, jun., has fixed on the year 1796 as the period of his father's first proposing a breakwater at Portland; but it is rather unfortunate that he should have gone so far back for the purpose of authenticating his claims. It so happens that in that very year Mr. Milne, Captain Huddart, and Mr. Jessop, were employed by Government, to consider the state, preservation, and improvement of Portsmouth Harbour, and no mention whatever was then made of a breakwater, or any contrivance of the kind. Neither have I been able to discover any traces of one being mentioned in this country by any person prior to 1806, when Mr. Rennie first proposed the one at Plymouth. His report, however, was not printed till 1812, and till that was printed little appears to have been known on the subject by the public; but the moment that report and the papers connected with it were published, the plan was much discussed, and by many was objected to, so that after all the arrangements had been made, and the work actually commenced in 1812, it was far from being popular. It is, therefore, most singular, that while the measures proposed for the improvement and preservation of Portsmouth Harbour, in 1796, were deemed of doubtful utility, and those of Plymouth questionable, there should not be found some trace in the archives of Government, or in the public journals, of Mr. Harvey's plan for a breakwater at Portland, prior to my sending Mr. Dodd down to Weymouth on the 29th of August, 1813. If any such plan had been discussed prior to that time, it would surely have come to the knowledge of Mr. Henning the banker, or his brother the solicitor, or Mr. Stewart, the lessee of the quarries, from which we calculated on being supplied with materials, or some of the pilots of the harbour (many of whom questioned its practicability, even when I was down in October); and as surely some one or other of these persons would have mentioned Mr. Harvey's proposition to us, if they had before heard of such a thing. Above all, how is Mr. Harvey's own silence to be accounted for? He was living on the spot, when many melancholy losses occurred in the neighbourhood; and his humanity would, I am sure, have prompted him to have pressed the measure on many of the influential persons that visited his library between 1796 and 1812. Had ten years' consideration and reflection, between 1796 and 1806, made the same impression on him, as Mr. Dodd did in a few days in 1813, Mr. Harvey would probably have saved the country all the expenses between 1806 and 1812, and the cost of the Plymouth Breakwater into the bargain.

With respect to the suggestion of the thing to Mr. Idle, as far as I am concerned, it was almost a necessary consequence of a train of circumstances which had just occurred. I had just returned from a visit to Plymouth, where I had witnessed what was doing with respect to the breakwater there, and had heard the subject much discussed in every company I was in. I had also just seen a report to the French government of the state of their great work at Cherbourg. The selection of its situation by Vauban, the confirmation of his judgment by Bonaparte, and the importance that was then, and had from its first suggestion by Vauban, been attached to it by the French nation, were deeply impressed upon my mind. I thought the measure worthy of the great man who first conceived it; and the completion of it in its present form will be a lasting monument to the memory of the extraordinary character who planned and in part excavated the inner basins. I saw that it was what Vauban intended it should be in a maritime war with this country—a point of great annoyance; and happening to be acquainted with one of the officers serving under Sir Pulteney Malcolm, when stationed off Cherbourg, I became aware of the difficulty and danger that must attend any attempt to blockade a considerable fleet within it. I was sitting on the summit of a hill, 400 feet above the sea, overlooking one of the finest bays in the world, just opposite Cherbourg, and my attention having been drawn to the subject of repairing the little pier at North Point, I must have been one of the stupidest dolts in the world if a more important measure had not presented itself to my mind. It did do so—it was the impulse of the moment—and I instantly fancied myself standing on the top of Portland, overlooking the imposing fleets I had frequently contemplated from the heights above Torbay, in which, by-the-bye, I had witnessed the loss of the Venerable, and a frigate whose name I forget, and which I saw clearly would not have been lost if they had been riding in Portland Roads, under the shelter of such a breakwater as was contemplated at Plymouth, and had been executed at Cherbourg.

Having given the requisite notices, as already stated, and lodged the plans, sections, and specifications, preparatory to an application for an Act of Parliament to carry into execution the measure which Mr. Idle considered had the approbation, and would receive the support of Government, he had a slight attack of paralysis, and was ordered to abstain from all exertion, and every thing likely to create excitement; the measure necessarily stood over.

Notices were given and plans lodged the following year at Mr. Idle's request, but he never recovered sufficiently to proceed with the measure; and I will not extend this statement (already too long) by any thing which passed between 1814 and 1824, in which latter year a terrible storm occurred on the 23d of November.

Apprised of several casualties which a breakwater at Portland would have prevented, I accused myself of not having been more strenuous in pressing for its formation, and resolved once more to visit the place.

Mr. Dessiou was now dead, and I had no one to verify the bearings and soundings, if the measure should be taken up; I, therefore, took down Mr. Fullerton, an elder brother of the Trinity House; and after he had informed himself of the position I had selected for the breakwater, he went to Teignmouth and laid the plan before Lord Exmouth, who, after giving the subject his attentive consideration, made a slight alteration in the line I had before laid down; and the one now laid down in the chart (a copy of which accompanies this) is the one selected by him, and laid down with his own hand.

On my return from Teignmouth, I prepared the accompanying "Suggestions for converting Portland Roads into a Harbour," printed them, and sent copies to all the members of both Houses of Parliament, to all the public departments and offices of the Government, to the Trinity House, India House, and Lloyd's, to all the principal sea-ports, to the Shipowners' Society, to the several club-houses, and to a great number of naval officers and commanders of merchantmen; and in consequence of this dispersion I received several memorials in favour of the plan, numerously and

y signed, which I forwarded
'asury on the 22d of November,
h the following letter:—

November 22, 1821.

ls,—Since I had the honour of
to your Lordships, individually,
the annexed Suggestions, I have
:be books at Lloyd's Coffee-house,
iat the number of casualties that
een the Start Point and the North
upon the coast of England alone
of which might, and the greatest
ich would, be prevented by a har-
rtland), amount, upon an average,
nnually, many of them attended
ientable loss in numbers of valu-

irs by the Ramsgate Royal Har-
t Account, printed by order of the
Commons, May 17, 1826, No. 371,
nnage on which dues were collected
to 1,967,808 tons; and I humbly
your Lordships, that it would not
easonable estimate if I stated the
ich ton of shipping, with its cargo,
age value of 20*l.* per ton; but that
ime a data, to which no possible
:an be raised, I will take each ton
g, with its cargo, at 10*l.* per ton,
e value of the shipping and car-
ed, to amount to 19,678,080*l.*
lships will see that, if dues were
qual to one farthing per ton on the
ount, it would produce a revenue of
which would not only pay the inte-
e capital requisite for the construc-
e breakwater, but would leave an
rplus to go in aid of the sinking-
which means the extinguishment of
respect of the harbour would be
ly accelerated.
loubt remained as to the import-
e work, and of its estimation in the
:hose best capable of appreciating
and most interested in its execu-
nnexed memorials, signed by mer-
ip-owners, and masters, must re-
it doubt from your Lordship's

ars, by the Report of a Select Com-
the House of Commons, printed,
to an order of the House of the
, 1826, No. 404, that there are, in
districts of Ireland, and in districts
d and Scotland, a number of able-
:tive labourers unemployed, pro-
:h a degree of destitution, misery,
oration of condition amongst the
classes, with such a reduction in
of labour, as to render them utterly
t to supply those means of support
istence *that are necessary to secure*
a healthy and satisfactory condition of the community.

Under these circumstances, permit me to suggest to your Lordships, that the work I have the honour to submit to your consideration, will afford profitable occupation to a great body of the suffering and starving population; and I denominate it a profitable occupation, because it will be profitable to the labourer employed—it will be profitable to the districts that obtain relief by a partial abstraction of their surplus population—it will be profitable to the merchant and ship-owner, inasmuch as the security it will give to the channel navigation will reduce his risk and premium of insurance beyond the amount of the farthing per ton impost levied upon him; and, above all, it will be profitable to the kingdom at large, because it will be the means of preserving many valuable lives.

Deeply impressed with these sentiments, permit me to add my humble hopes, that your Lordships will give the subject such consideration as you may deem it deserving of, at as early a period as your other important duties will permit; and that it will become my duty to communicate the favourable sentiments of your Lordships to your Lordships' respectful memorialists.

I have the honour to subscribe myself,

Your Lordships'

Most humble and obedient servant,

A. LAMB.

The "Suggestion" published in 1826, besides embodying the principal facts and considerations contained in the before-recited documents, contained a revised estimate of "the means of constructing the proposed reef or breakwater," which reduced the probable cost of the work from 780,840*l.*, Mr. Dodd's estimate for 2 miles, to 400,000*l.* for 2½ miles. Accompanying these Suggestions were six plates, illustrative of the proposed breakwater, and the craft and machinery that would be required for its construction, as also a copy of the Bill which it was proposed to bring into Parliament. I send you a reduced copy of so much of plates 1 and 2, as shows the line fixed on by Lord Exmouth for the proposed breakwater, and the elevation I intended it should have, and shall be much obliged to your giving them a place in your pages, along with the present communication. In the chart, fig. 2, W denotes the situation of Weymouth,

W R Weymouth Road, P the Isle of Portland, N North Point. F the floating Light, B B the line of the intended breakwater, and S S the proposed stone shipping piers.

Trusting that the great national importance of this projected improvement will be considered a sufficient apology for the extent to which I have felt obliged to trespass on the attention of your readers, and not without a hope that, in vindicating my own claims to its origination, I have been able to throw such new light on the subject as may serve to accelerate its accomplishment (of which, sooner or later, I can entertain no doubt whatever).

I remain, Sir,

Your most obedient servant,

ALEXANDER LAMB.

Manchester-buildings,
Oct. 15, 1834.

MODE OF WORKING THE COMMON PADDLE-WHEEL, WITHOUT CAUSING ANY VIOLENT COMMOTION ON THE WATER.

Sir,—In consequence of the numerous and fatal accidents which occur on the river, from the agitated state of the water, occasioned by the powerful action of the wheels of steam-vessels, I am induced to request the insertion in your useful Magazine of a very simple improvement and addition to the paddle-box, which if adopted will, I have no doubt, do away the sole cause which has consigned so many to a watery grave, and at the same time very much promote the speed of the steam-vessel.

It is universally known that sailing vessels, without steam-engines, do not produce in any degree the same agitated state of the river, though proceeding with equal rapidity. The difference appears to arise from the power of the wheels of steam-vessels being let loose upon the water, without any mode of confining the water to its intended purpose of affording its necessary resistance to the float or paddle of the wheel.

Those of your readers who are acquainted with the usual mode of applying the water to the wheels of water-mills, through the means of what is called a conduit, will immediately see that the wheels of a steam-vessel are made to act upon the water in the most disadvantageous way possible.

I am aware that there is no *direct* comparison between a water-mill and a steam-vessel, because in the former case the water is applied to the wheel, and in the latter the wheel is applied to the water. But there is one principle, or positive rule, which attaches to both, and that is, that in both cases the water must be cautiously brought to bear and be closely confined to the action of the wheel, or it cannot answer its intended purpose. In a water-mill the water, from the moment it approaches from under the hatch, or gate, is instantly thrown upon the wheel, and confined by a front raised exactly to suit the circle of the wheel, and is made to pass through what is called the conduit, which is floored and made perfectly upright at the sides; the floats of the wheel, too, are made to pass as close to the bottom, and also at the sides, as possible, consistent with safety, leaving just room enough for the wheel to clear. When the water has passed the centre of the wheel behind, it has done its office, and is made to pass off by means of the conduit to the watercourse or river below.

In the case of a water-mill the water acts by its gravity and velocity combined. In that of a steam-vessel it can *only act by its inertia*, and by affording its resistance to the float or paddle. In both cases a conduit is equally necessary to confine its action to the wheel; but in the case of a steam-vessel this necessary measure is altogether overlooked. The wheel of a steam-vessel is brought to act upon the water with the whole power of the engine, with floats or paddles very scanty in their surface-measure, and a great part of the water passes off under the bottom of the wheel, and a much greater portion at the sides, and the remainder at the surface, which, rising in some measure at the centre of the wheel, interrupts the stream thrown back, and the greater portion escapes at the sides with sufficient force and velocity to endanger every ferry-boat with its passengers within its reach. It must, I think, be obvious to every reader, that an enormous proportion of the engine power is wasted and totally lost, from the want of a better mode of confining

the water to the action of the wheel. This I consider can only be done by a conduit attached to the paddle-box, which may be fixed at a very moderate expense, without making the slightest alteration in any part of the machinery of the vessel. The conduit must be a wooden inclosure, with a bottom and two sides, and of course open at both ends to admit the access and escape of the water. It must form the lower part of the paddle-box, and its breadth and depth must be that of the float or paddle, and the paddle must be brought quite down to the floor, as near as possible, leaving room only to clear. The conduit should extend about 8 or 10 feet beyond the acting paddle, in the centre of the wheel at the bottom, toward the bow of the vessel, to receive the water; and as the water, when thrown back, is to afford resistance to the paddle by its *inertia only*, it will be necessary to continue the conduit a considerable length, because the greater the body of water contained in the conduit, the greater will be the quantum of inertia and resistance to the paddle, the effect of which will be an increase of speed to the vessel.

The bottom of the conduit must be perfectly level, and it must be fully understood that the water in the after part of the conduit is not to be in any degree confined, but is to have the most easy and ready mode of escape. To avoid the possibility of such an occurrence, the sides of the after part of the conduit may be brought up 6 or 8 inches above the upper part of the paddle, which would raise it at the sides a little above the surface of the water, and thereby increase the facility of its making its egress; and this part of the conduit may be covered, or not, as found convenient. If covered, it would furnish a floor for useful purposes, particularly if railed in, but it must be left uncovered at the bow end, to admit the free ingress of the water. By thus conducting the egress of the water through the conduit, after the wheel has acted on its inertia, it will pass off at the stern in a right line, and with such comparative stillness and quiet, as to be altogether incapable of endangering the smallest boat within its influence.

The conduit here described will be equally useful and advantageous to twin-boats, and *vessels of every* description driven by paddle-wheels; and I am quite satisfied that if the owners of the American steam-rafts (who, for reasons which do not appear, prefer the form of a raft, instead of the double canoe, as adopted by the untutored but ingenious and intelligent savage, with whom originated the discovery of the principle, and the safest and best mode of applying it,) were to try the effect of this simple and cheap improvement, they would find the result to be a very considerable increase of speed, with their present steam power, without taking the benefit of *the unlimited capacity of carrying sail, which necessarily attaches to boats and vessels of this description.*

I would also particularly recommend, for single-bodied steam-vessels especially, the application of a bow rudder, to be fixed to the bow by means of iron bars, one on each side. It will greatly increase the steering power and control over the vessel; and in a high sea, when the rudder at the stern is so far out of the water as to be useless, the bow rudder would be in full power and operation. *But it must in all cases be hung on an additional stem.* If it is hung on the original stem of the vessel, it will be ungovernable, and be directly opposed to its intended purpose.

Having minutely described the form and principle of the conduit, I trust your mechanical readers will not consider a drawing thereof necessary.

I remain, Sir,

Yours respectfully.

W. ALDERSEY.

Homerton, Sept. 24, 1834.

THE CLAIMS OF MATHEMATICAL SCIENCE.

Sir,—I much regret, that, in honouring your pages and myself with some remarks on my recent article on mathematics and the mathematicians, Mr. Exley did not extend his observations to a greater length, for he is well entitled, because he is well qualified, both as a mathematician and a philosopher, both as a man of universal information, of varied learning, and of powerful ratiocination, to pronounce an opinion on the subject in discussion, deserving the most respectful attention. I am the more bound not to withhold a proper tribute

to his merits, because I have already taken, and may have further occasion to take, exception in some degree to his theory of physics, and in the present paper intend to offer some strictures in opposition to his remarks. Not that I would deprecate, or admit the necessity of deprecating offence; for so long as observations are offered in the love of truth, and uncontaminated with that uncandid and captious spirit which controversialists (even among your correspondents) are too apt to evince, I am fully assured they will be received with "that stronger attachment to truth, than to any erroneous system," which he professes to entertain.

I fear, from his too short but pithy remarks, he has imbibed the impression, that I have laboured to decry mathematical science, though my observations, he will observe, are on its *comparative* value and importance. Nay, it is quite in accordance with my views, that even "the mere mathematician is not to be set aside;" for, almost at the very outset, I stated that this class of men "are, doubtless, *valuable members of the body scientific*, but that some among them (the least generally informed) are sadly inclined to over-estimate the honour of their station, and the comparative value and importance of their labours." Apart therefore from, and besides its obvious misuses, there is surely sufficient ground for animadversion in the fact, that the excessive reverence for this science (be it usurped, or freely bestowed) which so much prevails, facilitates with a baneful influence on the best interests of philosophy, a too favourable reception, for every thing, however crude, which is presented to us clothed in its forms. It certainly is within the verge of useful discussion to consider, whether the primitive and long acknowledged claims of this science to just respect, have not *in our day* bribed, and even forced, our reason, by its inordinate but imposing pretensions to a false, because extravagant, estimate of its value and importance. It is true, as Mr. Exley says, "that no one will plead for the misuse or misapplication of the science; but then there are many who will debate what is or is not deserving of that reproach, and, in the general prostration of the mind to mathematical genius, the danger is, that we may esteem as legitimate what may prove to be of spurious birth.

In the rapid march of knowledge—the knowledge of nature, the genera[illegible] mind has been strengthened and freed, in some measure, from this prejudice; bu[illegible] the time was, when it was thought n[illegible] misapplication of mathematical scienc[illegible] to apply it to human physiology—whe[illegible] even the fanciful hypothesis of celestia[illegible] vortices was thought to be illustrate[illegible] and particularised in man's bodily frame and the time may be, when application now accepted may be thought to be [illegible] misuse.

When the mathematics was the onl[illegible] science of which mankind had to boast—it was naturally regarded with unbounded[illegible] veneration. When the vain philosophy of the schools was discarded, it presented fresh claims for admiration and regard. The feeling has descended to our times, though the circumstances which justified it have passed away. Philosophy has entered, and is daily entering on other domains than those of quantity; and that science is now but auxiliary, and only occasionally, to more enlarged, and, let me add, more highly intellectual pursuits. Yet an antiquated and almost exclusive admiration still clings, though with a faltering hold, to the public mind, equalled only by one other prejudice—the reverential respect which is yet awarded to classical learning: these have been respectively fostered by the two Universities, once truly the lights of a by-gone age, but which are now visible only in the pervading darkness of their own precincts.

High mathematical knowledge is not to be turned to account in the ordinary walks of life. Besides, even where the sphere of its exercise is not wanting, other higher and rarer endowments of the mind—those which constitute the philosopher—are requisite to enable its possessor to bring it discreetly and powerfully into operation. Is it not infatuation, then, to allow the mere power over an instrument of knowledge, to usurp the place in our estimation, which should be assigned to its adroit and skilful use in its wise and efficient applications to appropriate and useful objects? And is it any thing better than infatuation, when we hear it said of any one that he is a great mathematician, if he be nothing better

than this, to look up to him as being qualified, in virtue thereof, to take the lead in the ways of knowledge, and to ascribe to him pre-eminent intellectual powers. Some mathematicians will not countenance this delusion. It was said of one of the celebrated French analysts, that he expressed his surprise at finding the study of chemistry to be not more difficult than that of the mathematics; and a distinguished living mathematician is accustomed to say of any thing of little difficulty, that "it is as easy as algebra:" an expression which will find a readier acquiescence; but still it shows that, in this gentleman's opinion, this *kind* of study is not very arduous.

I have just adverted to the two branches of learning which separately distinguishes each University, and which, if not pursued to the entire exclusion of other studies, characterises and gives celebrity to these places respectively, and to which honours more particularly appertain.

Mathematical knowledge and classical literature, it is readily admitted, are of great value, and it would manifest unusual stolidity to deny it.* It is even proper, when peculiar aptitude ensures success, that for the purpose of attaining high excellence some should devote their attention almost exclusively to their study; but in regard to persons in general, among whom it would be folly to expect that Parrs and Eulers may abound, and not desirable that they should, it is contended, that too much useful time, yea, too many of the world's interests have been sacrificed to the pursuit of these attainments, which unavailing and unproductive probably in their end, have been stimulated only by a false opinion of their all-engrossing importance. The fault consists in allowing brilliant instances of particular and perhaps professional attainments, to seduce our judgment into a magnified estimate of their value, or into a diminished opinion of general acquirements being essential to a liberal education, but which general knowledge, after all, may in many cases be highly conducive to success in the more favoured pursuit, and must in most cases be absolutely necessary, in order to render that pursuit, in its application, beneficial to society. Ardent youth is naturally impelled to tread, though with humble steps, the path which men of distinguished talents have irradiated with the halo of their glory. Fired with enthusiasm, all his energies are engaged to follow up the chosen track; he becomes insensible to every thing besides; he is deaf to the voice of wisdom; he responds not to her calls to explore the other avenues of knowledge, but contemptuously regarding them as by-paths, insignificant and obscure, he pushes on, till at last he falters, and finally he falls short of the high object of his aims; meantime he has lost the goodly prospects which awaited him on every hand, he has enjoyed only a few contracted views, he has had some partial glimpses, and which, to his purblind vision, have appeared to be all that was worth a thought in nature's wide expanse, showing, that those illustrious men who, not improperly, have been called the lights of the world, may, under some circumstances, truly prove to be lights also which "lead to bewilder, and dazzle to blind." Admit that the aspirants to honour and distinction have succeeded to the very stretch of their ambition, and what do we have as the most favourable result, but men of one idea, men of an exclusive theme, men admirably suited to become the professors of their peculiar learning, but who, in the ordinary affairs of life—yea, in the ordinary walks of knowledge, manifest a simplicity, not to say an imbecility, which makes even the illiterate smile. Their vocation may be honourable, and the sphere of their duties useful; but still it is the sphere of a class of individuals, and for that reason they ought not to be considered as being the exemplars of the course of study befitting the community of the learned. Besides, though well qualified to be instructors, would they be less, or rather would they not be much better adapted for that office, if they had taken a more varied and extended survey of things? Would they not enlighten, and more intensely interest us, with illustrations and analogies gathered together out of w

* Why should Mr. Frend continue to impute such nonsense to me, by stating my explanations on this point to be unsatisfactory? Is it impossible, then, to a mathematician to take any other than *extreme* views of a subject, unmodified by influential considerations? or to entertain any other than *ultra* and abstract opinions? To such a course his mind is certainly biassed by his studies; and does not Mr. Frend himself furnish a case in point? To persons of this cast any thing like discrimination *carries the appearance of inconsistency or contradiction.*

the territories of knowledge? Would not their observations be more marked with wisdom, their positions advanced with greater discrimination, and their principles receive that salutary modifying and moderating correction, which enlarged and liberal views fail not to enforce? And, as members of society, would they not be less exacting and less monopolising of claims to paramount consequence for themselves and their pursuits? Would they not be more moderate, more accommodating, and more distinguished for amenity in general intercourse, and in the transactions of general affairs? In the multifarious concerns of busy life they are manifestly incapable of taking a judicious part. The ruling spirit of their theme mars all their perceptions, sways all their opinions, gives a tinge to all their thoughts, and particularly spoils the faculty of taking a correct estimate of things, for they always refer to their own pursuit as the standard by which they judge of the value of others. The observations contained in this paragraph have been suggested, and may have been illustrated, by some passing events of the day, which it would be indecorous to specify, but the parallel of which most persons will be able to furnish for themselves. I have also to apologise to Mr. Exley for introducing them in this correspondence, for nothing relating thereto, or to him,* has called them forth. They are also becoming too general, for they apply to other subjects besides the mathematics; let us therefore return to that which is more immediately before us.

Mathematical knowledge was the first acquirement of man, as it is of men. This is, as Mr. Exley properly remarks, the order of nature; but it is significant also of the simple and elementary nature of the procedure of the understanding by which it is disciplined to its attainment, and it was for the purpose of showing this that the quotation from Blakey's logic was introduced. That it is not more general—that so many "neglect or reject their birthright," as Mr. Exley considers it to be, must not be attributed, then, to the strong intellect possessed only by a few, which is requisite for its acquirement, but to the repulsive manner, probably, in addition to its not being in itself very attractive, in which it is first presented to our notice. The point which I wished to establish, and to which the testimony of Mr. Exley is the more valuable, because he is peculiarly competent to give it, is the fact, that the mathematics is quite within the reach of ordinary talent. Though I admit, with Mr. Exley, "that mathematics is the first science in the order of nature," it does not follow that I ought also to admit that it is pre-eminent in honour and utility, which it was the drift of my observations to disprove; for mere priority confers no particular value, else would common arithmetic have pre-eminence over the mathematics itself, to which it is the first or elementary step.

Mr. Exley asks, "Why should mathematics be set in opposition to practice? Had Priestly, Franklin, and all practical men, the inventors of steam-engines, and others, been great mathematicians, could this have made them less practical, or less successful in their practice? Who was more practical than Newton? His optics present a model for all practical men." I would say, in reply, that, in all probability, if these men had been great mathematicians they would not have been what they were—the benefactors of mankind; and in proof of this, I refer to what is indisputable, that the great mathematicians have not been practical men, and that the most eminent and successful men in practice have not been mathematicians. It is a curious fact in psychology, which I have in my previous paper endeavoured to explain, that these separate pursuits do not proceed together with an even flow, but that one occupies the mind almost to the entire exclusion of the other. Of course there are exceptions, else would the proposition be not the enunciation of a general fact, but a mere truism. Newton was an illustrious exception, and I had myself referred to him as such. He was more than possessed of practical views; he was an operating experimentalist,

* I remember, however, that a paper from Mr. Exley, read before the Royal Society, met with very cavalier treatment, in one quarter, merely, it would seem, because it did not chime in with particular individual pursuits; and we all know what intestine broils existed in that learned body, for want of, not to say mutual assistance, but even mutual toleration among the respective partisans of the several branches of science, and which, as having occurred many years since, may now be properly adverted to as examples for warning and instruction. Let us hope that the British Association for the Promotion of Science will introduce a *new era of harmony and co operation.*

very ingenious one too, and a perative mechanic to boot. May ermitted to say, that these re- ave been occasioned by one who an exception, and therefore it is se pursuits do not appear to him scordant. It is true, as he inti- that they are not "to be set in on," if by that he means *ir- able* opposition to each other, ner in juxta-position, by the way and antithesis; but though there cessity in the nature of things, great probability in the reason gs, that great attainments on and should mutually disqualify d for the opposite pursuit, and obability in the course of things y should incapacitate it — the the reception of the other. This the subject may appear to some etter corroborated, by using the expression of the fact before hat those who have made equal ents in both pursuits, have com- ot been eminent in either. It admitted, however, that there isted an illustrious few, to whom nities have not been denied for rcise of abilities equally rare. e Dr. Thomas Young was emi- listinguished for practical views; rvaded and characterised all his and gave a peculiar tone to hich were the most abstract; like the gentleman on whose I am now commenting, uncon- circumstances may have con- s aims, more than others, to the ther than to the laboratory. If, , these pursuits, so distinct in ves, are more commonly pursued a course, be it remembered, which recommended—it is surely very open to discussion, without set- m *injuriously* "in opposition to her," whether the one or the the more arduous, the more the more honourable, or the tellectual. Without pretending e in a case where personal pre- s will turn the scale, it is enough o put in at least an equal claim distinctions in favour of prac- rsuits, as including those which rvational, inductive, and expe- ; or to bar the speculative one, rate, from carrying off all the —a triumph *which it has* been too much the custom to concede to it. I have advanced these claims to estimation, not particularly on the ground of utility, which is surely undeniable for geometry of the highest order, and the science of quantity generally, and as applied to the motions of the heavenly bodies in particular, flourished for ages on the Ganges, without any beneficial influence on the interests of mankind, and was imported into, or revived in Greece, without superseding or even correcting the Stagirite's logic and philosophy—but I have advanced them more especially on the bolder and less usual plea, of at least equal if not superior intellectual powers, and as much patient and laborious perseverance being required in those pursuits, which trace the connexion of *things*, as in that which establishes a connexion of *ideas*—in those pursuits which unravel to the core, as in that where we have the naked essence already formed to our hand—in those pursuits which take the subject matter to disembarrass it of its extraneous envelopment of circumstances, as in that where we can conceive of it at will abstractedly, and work with it as such wherewithal—in those pursuits, I say, where, having arrived by an extensive analysis at the elements or principles which are the objects of our research, we have to embrace, in their natural order and degree, the whole circle of combining influences, however diverse in their nature, ere we can erect a philosophic system, or advance a true explanation of phenomena or events, as in that where the materials of a simple though imposing superstructure being called into existence at our bidding, and impressed with qualities at our pleasure, are of one and the same nature, of restricted and homogeneous influence, devoid of interfering and collateral action, and only require for their regular collocation an unembarrassed unilateral proceeding. Besides the reasons now incidentally alluded to, as subsisting in the inherent differences between the separate subjects, I may adduce in proof of my position the indisputable fact, that the speculative science advanced by extensive strides, and was brought to a comparative perfection at a very early period from its foundation; whereas the practical sciences approached to maturity only by slow degrees, and are yet in progress.

showing, that the difficulty in one case is of a character to be easily and quickly surmounted, and in the other that it is more formidably intrenched. Again, those rapid advances were made comparatively by a few individuals; and though it seems paradoxical, it is not the less true, it was precisely because the labourers were few, that those advances were rapid, extensive, and broadly seen: for if the nature of a work be so toilsome and difficult as to require a great number to engage in it, the steps of its progress, though innumerable, must necessarily be minute and scarcely perceptible. The speculative science, therefore, must come more naturally and easily within the compass of our faculties, since a few has sufficed to cope with it, and reduce it to order. The paucity of labourers sufficient to produce great effects, argues also that this science does not demand much more than ordinary talents, since the chance of finding those which are extraordinary is in such case greatly lessened. I cannot, however, go so far as to say with Mr. Exley, "we need not wonder, then, that all men are born mathematicians, though many neglect or reject their birthright." This would be to humble their pretensions, more than any one, besides a mathematician, dares to do.

In my next communication I intend to notice those observations of Mr. Exley which refer to his own theory of physics, and to take a slight review of it.

I am, Sir, yours, &c.

BENJAMIN CHEVERTON.

October 20, 1834.

P. S.—Mr. Frend has very unnecessarily occupied your pages, in quoting various testimonials in favour of Euler and the Bernoullis, for, unquestionably, they were illustrious mathematicians, and I stated as much. As to the *tractory* curves, which he thinks are improperly named, I can only say they were so called by Euler himself, though they defied even his skill to render them *tractable*. The witticism that Mr. Frend founds on this poor equivoque, is about as smart as his invitation to me to give the equations of a few of these "*strange curves*," in which attempt even Euler failed. He further allows himself to say, that certain ***highly useful experimental*** researches, which he enumerates, "are of course, according to the Chevertonian philosophy, mere matters of moonshine." I would respectfully inquire of Mr. Frend, why he thinks it necessary to resort to misrepresentation, and why the calm face of philosophic discussion should be disfigured with the ebullitions of temper? Those who honoured my paper with a perusal, will not be induced by any one to believe that its purport was not precisely to establish the superiority of practical and experimental pursuits over those which are speculative. Mr. Frend has discovered an omission in my enumeration of Kepler's laws, which he contends were three. He is perfectly at liberty to consider it to be *a law* of planetary motion, that the orbits of the planets are ellipses, though, according to my notions of phraseology, it ought rather to be called *a fact* in the planetary system. It is not unusual to speak in the *dual* number of these laws; but it is even more common, perhaps, to use the singular number, and say, Kepler's law. As a foreigner, sensitively jealous of the fair fame of foreigners, it may be allowed to him to be a little captious.

MR. HALL'S STEAM-ENGINE IMPROVEMENTS.

Sir,—You have done me the favour to draw the attention of your readers, more than once, to my improvements in the steam-engine. Permit me now to state, that I have obtained patents for these improvements for England and the colonies, Scotland, Ireland, France, Belgium, Holland, Prussia, Austria, and the United States of America;* and to subjoin a summary of the important advantages which are found in practice to result from them.

The leading feature of my invention, as you are aware, consists in effecting the condensation of the steam from the working cylinder, without injecting water into the condenser, which in most cases contains impurities, by which means I am enabled to employ the same water constantly, over and over again, to furnish steam; and the boilers being once

* It is my intention to dispose of half of each of my foreign patents to some respectable persons, who will respectively undertake the superintendence of them, and shall be glad to treat with any person wishing to become a purchaser.

charged with pure water it will always continue to be in that state, however long it may be used, and by very simple means the needful portion of distilled water is produced to supply any waste that may arise in working the engine: and all the steam that usually blows away at the safety-valves is secured, and the distilled water (resulting therefrom) is returned to the boilers.

Engines with my improvements applied to them have been at work nearly three years, and amongst the advantages which they possess, and which are confirmed by experience, are the following:

1. A saving of fuel amounting to fully one-third of the ordinary consumption.

2. A very considerable increase of power, arising from several parts of the invention.

3. The rapid destruction of the boilers from the corrosive action of sea-water, or from incrustations of earthy matter, is completely prevented, and without ever requiring cleaning, they remain constantly clean and effective; no matter how long they are used.

4. The water in the boilers is constantly maintained at the same height, without any attention on the part of the fireman; thus obviating, in marine engines, the risk on the one hand, of their being burned out by the neglect of the attendant to keep them sufficiently supplied with water, and on the other hand the danger arising from water passing with the steam into the cylinders when the boilers are too full, whereby accidents of the most serious nature are frequently occasioned.

5. As no deposit of any kind can ever take place in the boilers, no blowing off of water on account of its accumulated impurities is necessary, and the boilers remain constantly in the most clean and efficient state for generating the steam, by which means, principally, the great saving of fuel above mentioned is effected.

6. Smaller boilers are required with the improved engines than with the common ones; which latter require the boilers to be made so large as to generate sufficient steam, even when they are coated with scale, being of course much larger than is necessary when they are clean, as also on account of their requiring the dirty water (which is boiling) to be blown off frequently, and to be replaced with cold water: hence, by means of my improvements, a diminution of the first cost of the boilers is effected, and less space is occupied by them, which in a steam-vessel is a point of great importance.

7. A much better and steadier vacuum is obtained than in the injection engines, in which latter a large quantity of air is carried by the injection water into the condenser, whereby the vacuum is injured; the engines likewise act as correctly and powerfully when their speed is very irregular (whether owing to tempestuous weather and heavy seas, or to any other cause), as when their motion is uniform; whereas in common marine engines great care is required to regulate the injection water into the condenser; for as the vacuum causes the injection water to enter the condenser as rapidly when the engines are going at a slow as when they are going at a fast speed: and as it is impossible to regulate the quantity of injection water, according to the irregularity of the speed of the engines, great danger arises on the one hand of choking the condenser and air-pump by the admission of too much water when the engines are going slow; and on the other hand of deducting greatly from the power of the engines, by deteriorating the vacuum when the speed is great, and the quantity of water injected is too little.

8. The injury done to the air-pump by water impregnated with saline matter or containing extraneous substances is avoided; and as none but fresh water enters the pump, copper or gun-metal rods, buckets and linings become unnecessary, and the power required to pump the injection water out of the vacuum is saved.

9. The oil employed for lubricating the piston is not wasted, but enters the boilers along with the water from the air-pump, and may be drawn off and used again and again, so as most abundantly to lubricate the pistons and valves.

In confirmation of the above statement of the advantages obtained from my improvements, I subjoin a copy of the Report of Captain Martin, of the City of London steam-packet, and also the Report of Captain Wright, of the Prince Llewelyn steam-packet, on board of which vessels my improvements have been in operation a considerable length of time.

The St. George Steam-packet Com-

pany, after a careful investigation of the subject by a deputation of their engineers, who examined several engines in operation upon my principle, ordered a trial of it to be made on board the Prince Llewelyn; the result of which was so satisfactory, that they have executed an agreement with me for the immediate alteration of all their engines, amounting in the whole to 1880 horse power. They have subsequently got a pair more engines to work aboard the Air steamboat, which are giving equal satisfaction; and they are preparing the needful apparatus for the engines aboard various other steam-boats*. The General Steam Navigation Company have also adopted my improvements on board the City of London; and the Lords of the Admiralty have directed their engineers to examine their effect on board this vessel, have received a report so highly favourable (a copy of which is annexed), that I have every reason to believe that they will also be adopted shortly on board his Majesty's steam-vessels. The principle has likewise been applied to several land engines in different parts of the country, and they are working in the most satisfactory manner.

I annex a list of eminent engineers who, having fully investigated the matter, have taken out licenses for manufacturing engines upon my principle; also a list of the engines to which my improvements are already applied, and of those which are in preparation.

In conclusion, I would remark that the improvement may be readily applied to engines already constructed, without derangement of the parts, and without stopping them more than two or three days; and that in new engines the additional cost will be inconsiderable.

I remain, Sir,

Your most obedient servant,

SAMUEL HALL.

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* Mr. Halls' modesty has prevented his mentioning another fact of some interest, namely, that the St. George Company, besides entering into the contract mentioned in the text, have presented him with a gold snuff-box of the value of 150 guineas, in token of their sense of the important services which he has rendered to steam navigation by his present improvements. The inscription bears the appropriate epigraph of "Scientia et labore."—Ed. M.M.

Copy of a Letter from Capt. K. B. Martin.

City of London Steam Packet,
St. Catherine's Wharf, July 9, 1834.

Sir,—In consequence of your request, relative to a report on Mr. Hall's patent, now on trial in the City of London, I can assure you I am perfectly satisfied as to its present actions, and have every reason to believe that some trifling improvements will confer still more important results; and first, as to speed, I believe the vessel to have been nearly at the top of her speed last year, and when the improvement in the Magnet is considered, it convinces me that in fair weather and smooth water we are rather faster this; but with equal pleasure I add, that in a contra gale and head sea, the action is much superior to injection engine, in consequence of the vacuum being so perfect. On the 4th of July, in a heavy sea and head wind, we passed round from Ramsgate to Margate in 55 minutes; and on the 7th, although we had a fair wind and sail set, we did not accomplish the distance in less than 50 minutes. Last year, under similar circumstances in the rough weather, we should have been an hour and twenty minutes; and the quickest passage the vessel ever made, under the most favourable help from sail and fair weather, between Ramsgate and Margate, was 44 minutes; her average time was 55 minutes in smooth water. I can refer you to Mr. Braithwaite, who was on board several times, and delighted with the action of the vessel in a head sea and opposing wind.

The saving of fuel is about a ton per average passage, or six tons per week. The boilers when last opened were free from scale, and that part of them which I have remarked oxides or rusts quickest (viz. the edges of the water line), being lubricated by the oil which floats on the water surface, is preserved from that destructive effect.

The oil is not yet of sufficient depth on the surface of the water in the boiler to draw off for use; but as soon as it is, I am disposed to think there can be no waste of what is used for the pistons, as it is returned again and again into the boiler, and except in the case of new packing, has nothing to absorb it, or any where to escape. Thus much for the engines, which I believe susceptible of still further improvement; and as respects the vessel, I think her now better prepared and more staunch for another ten years of service in the Ramsgate trade, than when I had first the pleasure of receiving her from the hands of the builder.

I have the honour to remain,
Your obedient servant,
K. B. MARTIN.

Charles Bessell, Esq.
Secretary, General Steam Navigation Company, 69, Lombard-street.

Copy of a Letter from Capt. J. Wright.

Campbeltown, Argyleshire, N. B.
August 25, 1834.

Dear Sir,—I am certain you must think me neglectful, in my promise of giving you the account of the Prince Llewelyn's consumption of fuel, &c.; but this list was made out for you long since, and I thought I had sent it you, until yesterday I found it among other papers, it having been put with them in the confusion of quitting Wales; but I think it will not be deemed by you as a neglect on my part, as I can fully testify your improved condenser fully saves one-third of the fuel formerly consumed, and feel more fully convinced, if an engine was fitted with condenser, fixed in its proper place, according to your proposed plan, the saving would be nearly one-half of the fuel at present used on the old system.

I remain, dear Sir,

Your most obedient servant,

JOSEPH WRIGHT.

Samuel Hall, Esq.
Basford, near Nottingham.

Names of Engineers who have taken Licenses for manufacturing Engines with Mr. Hall's Improvements, and for applying the same to Engines already constructed.

Messrs. Maudslays and Field,	London.	Mr. William Fairbairn,	Manchester.
Messrs. Barnes and Miller,	do.	Messrs. Galloway, Bowman, and Glasgow,	do.
Mr. John Hague,	do.	Messrs. Fenton, Murray, and Jackson,	Leeds.
Mr. James Easton,	do.	Messrs. Rothwell and Co.,	Bolton.
Messrs. Fawcett and Preston.	Liverpool.	Messrs. Benjamin Hick and Co.,	do.
Messrs. Mather and Dixon,	do.	Mr. William Dean,	do.
Mr. Edward Bury,	do.	Mr. John Winwood,	Bristol.
Messrs. Peel, Williams, and Peel,	Manchester.	Mr. William Mosedale,	Derby.
Messrs. John and Thomas Sherratt,	do.	Mr. W. A. Summers,	Southampton.

List of Engines in operation with Mr. Hall's Improvements applied.

At Basford, Nottinghamshire,	Mr. John Fox	Proprietor,	1 of 12	horse power, upwards of	2½ yrs.
At do.	do.	Messrs. S. Hall & Co.	do.	1 .. 10	do. about	2¼ do.
At Bulwell	do.	Messrs. Cartledge	do.	1 .. 22	do.	1½ do.
At Manchester		Messrs. J. & T. Sherratt	do.	1 .. 14	do.	1¼ do.

The above Engines have the apparatus fitted to them according to Mr. H.'s first Patent, and those below have the Improvements applied to them for which he took out his last Patent.

Prince Llewelyn steam-packet,	St. George Steam Pack. Co.	do.	2 of 35	do. each	6 months.
Air	Ditto	do.	2 .. 35	do. each	2 months.
City of London	General Steam Nav. Co.	do.	2 .. 50	do. each	4 months.
At Stockport	Mess. T. Marsland & Sons	do.	1 .. 18	do.	

List of Engines in Preparation.

St. George steam-packet	St. George Steam Pack. Co.	do.	2 of 55	horse power each.
Emerald Isle	Ditto	do.	2 .. 80	do. do.
A New Vessel	Ditto	do.	2 .. 90	do. do.
Windermere	Mr. James Winder	do.	1 .. 55	do.
At Nottingham	Mr. Kendal	do.	1 .. 26	do.
At Sheffield	Coal Proprietors	do.	1 .. 65	do.
At Ipswich	Mr Ranson	do.	1 .. 14	do.

TOTAL.

Number of horses power in operation	316
Ditto....ditto....ditto..in preparation	610
Ditto....ditto ...ditto..contracted for	2,216

Report to the Lords Commissioners of the Admiralty.

(COPY.)

Admiralty, Sept. 15, 1834.

Sir,—In compliance with the request contained in your letter of the 11th instant, I am commanded by the Lords Commissioners of the Admiralty to send you, herewith, a copy of the Report of Messrs. Lloyd and Kingston upon your improvement in the steam-engine.

I am, Sir,

Your most humble servant,

JOHN BARROW.

Mr. S. Hall, Basford, Nottingham.

(COPY.)

Woolwich-yard, Aug. 7, 1834.

Sir,—Agreeably to your minute of the 1st instant, directing us to inspect, and report upon, the apparatus for the condensation of steam, invented by Mr. Hall, and fitted by that gentleman on board the City of London, we beg to state, that on the 5th instant we proceeded in that vessel to Ramsgate, and returned in her on the following day.

During the time we were on board, we had a full and satisfactory examination of the means employed to effect the abo

object, and also of the results produced by them.

We now beg to lay before you, the principal evils arising from the common mode of condensation, which is by the injection of cold water;—the manner in which the steam is condensed by Mr. Hall;—and our opinion, found upon the actual performance of the engines, of the efficiency of the means which he has employed.

As condensation is now effected, the greater part of the condensed steam never returns to the boilers, because it is mixed with a far greater quantity of injection water: which, when the vessel is at sea, must, of course, be salt water—hence, in this case, steam, which contains no salt, is continually leaving the boilers, and water, almost as salt as sea-water, is continually supplying its place. The consequence of this would be, if no means were taken to prevent it, that the boilers would, in a short time, be entirely filled with salt.

In order, however, to prevent this, a portion of the water in the boilers, which is considerably salter than sea-water, is periodically driven into the sea, and its place supplied with water a little less salt than the sea—the condensed steam forming a small portion of it. The water in the boiler is, in this manner, kept from exceeding a certain degree of saltness; but whatever care is taken—in long voyages especially—salt will accumulate—and sometimes in great quantities and of great hardness, so that it is with difficulty it can be removed. Boilers are thus often injured as much in a few months, as they would otherwise be in as many years.

The other evil necessarily resulting from this state of things, is (besides the rapid destruction of the boilers) a great waste of fuel, occasioned by the difficulty with which the heat passess through the incrustation on the inside—by the leaks which are thereby caused—and by the practice of "blowing out" periodically, as before mentioned, a considerable portion of the boiling water.

The obvious, and indeed the only, method to prevent the evils we have just described, is to return to the boilers the whole of the condensed steam; and this can be effected in no other way than by condensing it by means of cold surfaces, without any admixture of sea-water. This is accomplished on board the City of London by means of a vast number of small thin tubes, into which the steam passes, and the heat is abstracted from it by an abundant supply of cold water on the outside, the whole being contained in two iron casings, each of which is about *6 feet long, 4 feet high,* and 5 feet wide, *placed at the fore part of the engines, which are of the collective powers of 100 horses.*

Such a mode of condensation is a desideratum which, for many years, has occupied the attention of engineers, and others: but, we may safely assert that very little success has hitherto attended their efforts. The application of Mr. Hall's method, however, is so successful as to leave nothing to be wished for. The power of the engines is not, in our opinion, diminished: and there is no reason to fear that the apparatus will not be durable, as it is not exposed to a degree of heat sufficient to injure it.

We have omitted to mention many advantages which would be derived from the application of this system of condensation: such as, increased durability of certain parts of the engines, and the prevention of accidents, through carelessness or otherwise, arising from the condenser and air-pump becoming choked with injection water; and the additional security against the boilers being burnt, in consequence of the water in them being suffered to get too low. These advantages, and all others, appear to us to be of secondary importance, when compared with the great increase of the durability of the boilers, and the saving of fuel, which must necessarily obtain.

We may observe, in conclusion, that the means of preventing a waste of steam when the engines are stopped, and the supplying of the boilers with distilled water to make good the loss occasioned by casual leakage, have been well considered by Mr. Hall, and he has adopted some ingenious and practicable contrivances to effect all that is necessary.

(Signed)

We are, &c.

T. Lloyd,

John Kingston.

Captain Superintendent Warren, C. B.

THE PHENOMENA OF FLAME.

Sir,—I have lately read in your Magazine some very interesting papers on flame and combustion, by Mr. Rutter; and I cannot help venturing to make some observations myself upon the subject. I have long thought that the explanation hitherto given of the nature of flame was erroneous, particularly as regards the presence of oxygen in its interior; nor can I conceive how so eminent a philosopher as Davy could have made so glaring and palpable a mistake as he evidently did. I confess that till I read a letter on the subject, in your publication, I was myself satisfied (upon the authority of Davy, supported by that of Dr. Ure,)

phorus would burn in the inte-
alcoholic flame: that the fact
s not the case (and I have now
ır demonstration, certainly the
factory possible,) that it is not,
vith the result of the heat ex-
mentioned by Mr. Rutter; viz.
acing a lighted taper within a
ope or tow saturated with spirits
nd ignited, has now convinced
ny former ideas were correct,
oxygen cannot *be* in the interior
. I have found that when the
ry large, the undulations of the
ıg air, by making it unsteady,
nings by which air is admitted;
under these circumstances, the
s or taper burns or flashes for
, and the larger the flame the
uently this occurs: this might
ndation of the mistake of the
ers who first tried the experi-

ence of oxygen from the inte-
ame being thus satisfactorily
e theory of a burning candle is
ained, without having recourse
fetched, though certainly inge-
as of your correspondent, Mr.
his letter of January). The
ow rising in the wick is de-
by the formation of carbonic
itional and sufficient heat is
fect a second decomposition of
etted hydrogen—the carbon of
ng precipitated, increases the
of the flame; while the hy-
iting with atmospheric oxygen,
r which is instantly vapourised
ected with considerable force
des of the flame.
erior of the flame becomes then
ne, as it were, of carburetted
The appearance of the wick
fficient to prove the absence of
t is black, or, in fact, a coal;
by the continued wasting of
, it becomes too long to sup-
n weight, it falls to the side;
p, being left unprotected from
ic oxygen, loses its blackness,
nverted into ashes. I have
lmost the whole of the experi-
ribed by Mr. Rutter, in your
for May, and have been much
with the results I obtained.
ere to thank that gentleman
ts he has given, and to express
my admiration for the zeal with which he pursues and communicates his scientific researches.

The wire-gauze I have used in my experiments is very fine, of at least 950 apertures to the square inch. The following I consider a peculiarly striking experiment:—When a stream of olefiant gas is inflamed above the gauze, it gives a very superior light; and the higher within certain limits gauze is raised from the top of the jet, the fainter is the light, and the more abundant the deposit of carbon underneath the gauze. But this feeble blue flame possesses heating powers superior to that of the bright flame, a piece of platina wire becoming instantly white hot when held within it: this is evidently owing to the caloric liberated by the fixation of the charcoal.

I wrote to you last month on the subject of the chlorides of carbon; but from the non-appearance of my letter in the Magazine, I conclude that it arrived too late.* I shall avail myself of this opportunity to make a few more remarks on the same, as having since made the perchloride by Mr. Faraday's method; it may be amusing to some of your readers. Having drawn the air from a glass vessel by an air-pump, I screwed it upon a receiver filled with chlorine, and admitted a portion. I next screwed it on a vessel of olefiant gas, and let it remain a short time, after which it was exposed for a quarter of an hour to the sun's rays: it was then again fastened to the vessel of olefiant gas, and a further portion admitted; this was continued till the colour of the chlorine had disappeared, and the vessel remained full of olefiant gas. The fluid formed by the two gases being condensed on the sides of the vessel, chlorine was then admitted by repeated portions, till the fluid increased in quantity, and till there was an atmosphere of chlorine above it: the muriatic acid formed by the action of light was absorbed by water, and more chlorine admitted. By continuing this process the liquid gradually changed to the chrystalline solid in question, which remained in the vessel, together with a strong solution of muriatic acid, coloured blue by its action on the brass stopcocks.

* It has been since inserted. See No. [illegible], p. [illegible].—Ed. M. M.

Continuing the process recommended by Mr. F., I blew the remaining gases from the vessel, by a pair of bellows, and washed the solid from the sides with water—alcohol precipitated it: I then dried it between folds of blotting paper, and sublimed it in a glass tube; the sublimed portion was dissolved in alcohol, and poured into a solution of potassa. The new substance was, by this means, precipitated, free from muriatic acid; and being well washed and dried, it appeared in the form of a white powder. The smell of this perchloride of carbon was a pleasant aromatic, like camphor, but more powerful. When it was inflamed in oxygen it gave a very brilliant light; as it is not readily combustible, this experiment does not always succeed. The strongest mineral acids did not alter it, even at a boiling heat; ether dissolved it. I have not yet tried any more experiments upon this singular substance, when I have I will send them to you; and, in the mean time, shall be happy to hear that I have at all afforded amusement or instruction to any of your readers.

I am, Sir,

Your obedient servant,

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Bath, October 4, 1834.

INCREASING USE OF IRON, AS A MATERIAL FOR BUILDING SHIPS, HOUSES, &c.—FIRES FROM CHIMNEY FLUES.—HANCOCK'S STEAM-CARRIAGES, &c.

Sir,—A considerable time has elapsed since I gave my opinion in your pages, that iron, and, of course, other malleable metals, would ultimately supersede wood, as a material for the construction of ships and boats. That opinion seems now to be fast corroborating, by the increasing number of steam-vessels which are manufactured from sheet-iron; and I incline to think that the respective trades of ship and boat builders, perhaps carriage builders also, will ultimately merge in that of the engineer. All organised matter is necessarily imperfective in its nature, as regards the construction of works of art; at all events, until the mechanical arrangement of its parts has either been destroyed, or chemically interfered with. The very term "organi*sation," implies a succession* of stages—infancy, perfection, decline, death, and dissolution. Human ingenuity may arrest, but it cannot stop the ultimate dissolution of organised matter into component parts. It is true, that unorganised matter is also subject to decay; but, as the decay is not necessary but contingent, means can be taken to prevent it. When we use organised matter for the purposes of art, we use it in the state of death, and, consequently, not in its greatest perfection. In the article of wood, the qualities which, after death, resist dissolution for the longest period of time, without a chemical interference, are those which are dense and brittle. These are two qualities which render them unfitting for ships, wherein buoyancy and elasticity are the chief requisites—apart from durability. Wood, moreover, is scarcely, in any case, an homogenous substance. If the expense of iron for ship-building be objected to, the answer is, that an increased demand will infallibly cause great improvements and facilities in the modes of preparing it, and will ultimately render it cheaper to the consumer. We are yet far from knowing all its uses, or all the beneficial modes of alloying it. I think it probable that the time will come, when it may be so prepared as to destroy its affinity for oxygen, and make it as durable as silver, gold, or platinum. The mysteries of nickel, in conjunction with it, have not yet been thoroughly solved.

In the use of materials for works of art, artificial substances are commonly more desirable than these found in a natural state. The stone employed in our buildings is, for the most part, perishable, by the action of the atmosphere; and the glass in the windows will far outlast it. In many cases it is not an homogenous substance. The London University is a most unsightly-looking erection, in its irregular patches of black, white, and grey, not the result of smoke, but of differing chemical compositions; and some portions of the Strand bridge resemble old iron. We cannot use marble for external work in our atmosphere, and scarcely for an interior. In fact, limestone is unfitted for any thing but a very pure, dry atmosphere, and even then its softness renders it a poor material as to durability. It seems to me that there is as much difference between gypsum and

as there will ultimately be be-
the natural building materials
esent use, and such as art will
at a future time. We make sculp-
gypsum, and cover it with glass
rve it. The object should be to
e sculpture itself of a material
ly prepared, and hard as glass
A Parthenon of blocks of solid
orcelain, prepared and erected by
ry, without human drudgery,
object worth looking on as a
art. Our works in architecture
cely works of art. We rough-
chop into angular forms lumps
of Nature's preparing, and then
Lo, a wonder!' When we shall
ture's raw materials in the che-
nstituents, and work them up to
ocks for the erection of large
s, instead of mere brick with
coverings, it will be time enough
we have done something to out-
e Egyptians of old—provided
as the lawyers say, that the afore-
ildings be dedicated to purposes
y, *i. e.* the promotion of human
ss.

regard to a main constituent part
ur buildings in this variable cli-
he chimneys—I hold to my opi-
at the best and most economical
ould be, to use wrought or cast
es of a square form, built into
s. No other kind of chimneys
o durable, even if originally well
ted; and they are the only kind
h deceit or carelessness on the
the builder or sweeper can be
against. Chimneys which are
brick, even in the best manner,
e to decay, for a simple reason—
ks are put together with lime
When the fire is made, the lime
, and gradually pulverized; and
s are formed between the bricks,
icating with the wood-work.
ught to be built with fireclay.
many cases, even the joints of
ks are not fairly closed at the
nd the owner of the house has no
f ascertaining this. Sometimes
s are what is called "pargetted,"
are plastered inside with a quan-
ortar and hair mixed up with cow-
space will permit; but the "par-
is gradually burned down, and
chimney becomes worse than
before. It is a fact that many houses are burned down by the fire communicating from the chimney; and it is probable that one fruitful cause of smoky chimneys in old houses, has been the numerous air-draughts through the chinks of the brickwork. In the case of the late fire which consumed the houses of legislation, rumour has been busy attributing it to design But it seems tolerably clear that larger fires than usual were burning; that the chimneys were unusually heated; that the heat found its way out from the chimneys through openings of some kind or other, and gradually reduced the concealed wood-work to the state of live charcoal, which blew up into a blaze when the free air obtained access to it. "It is an ill wind which blows nobody good;" and the fire, if it has done some evil, has also performed an especial service, in cutting short all further useless debate as to the erection of a fitting seat of legislation. It is to be hoped that the site will now be changed, and that in erecting appropriate buildings for our legislators, those who have it in charge will choose a more eligible locality than the last, away from the unwholesome banks of a muddy river. Hyde Park, or Kensington Gardens, or the Regent's Park, would be much more appropriate.

It is odd enough that I have rumbled over several subjects, and come last to the only one on which I had intended to make a few remarks—Mr. Hancock's steam-coach. From the commencement of his experiments, I have looked forward to him as the successful competitor in this great public object; and it seems most probable that his unpretending and praiseworthy industry and perseverance will at last effect it. Amidst a host of quacks, it is a pleasing thing to find such a man steadily pursuing his object through a period of, I believe, six years. Just a hundred of your numbers back, speaking of steamers on common roads, I advocated their utility to save horses between the Bank and Paddington; your answer to it was—"Very desirable, but not so practicable. We think this the very worst road on which steam travelling could be attempted with advantage." It is on this very road that Mr. Hancock has so nearly brought his exertions to a successful conclusion.

I could suggest some alterations and desirable improvements to this gentleman, for the purpose of making his vehicles more eligible, as a means of public conveyance. In the first place, it seems desirable that the wheels should be of larger diameter, and also more nearly of equal size; albeit, it is true that lower wheels are more available with a light weight than is the case with a heavy weight; and that the greater part of the load is borne upon the hinder wheels. In the next place, the springs seem in need of improvement, though the weight of the carriage somewhat alleviates the jarring from the inequalities of the road. In the next place, it would be desirable to use some of the surplus steam or heat for the purpose of warming the passengers in cold weather. And last, not least, some means should be resorted to for getting rid of the unpleasant gaseous odour, generated from the friction of oil, which, both in steam-carriages and steam-boats, is, if possible, a greater nuisance than the jarring motion. Noxious gases are, in many cases, neutralised by mixing them with other gases. Would it not be practicable to do so in steam-carriages and steam-boats. It is a matter well worthy the attention of Mr. Hancock; for, whenever I have heard people objecting to his steam-carriage, the head and front of the offending has most commonly been the "unpleasant odour." There surely must exist in chemistry a sufficient remedy for this evil, without the expense being materially increased.

I remain, Sir,

Yours very truly,

JUNIUS REDIVIVUS.

P.S.—Query. Will it be practicable, at any future time, to use condensed gas as fuel?

THE CHICHESTER EARTHQUAKES.

Sir,—Observing, in a recent number of the Mech. Mag., an extract from a Portsmouth paper, descriptive of the shock of an earthquake with which this part of the country was lately visited, I am induced to suppose that some further account of the several shocks we have *lately felt may not be* uninteresting.

The first occurred about 10 o'clock on the morning of Sept. 18, 1833. The morning was fine and serene, but the preceding evening I had observed a luminous streak in the south-west quarter of the heavens, which extended from the horizon nearly to the zenith. The earthquake was felt from about Emsworth to Arundel, and northwards along a line nearly parallel with the river Arun. This seems to have been the limit of all the shocks, except the last, which was felt much further west, at Portsmouth, and, I believe, Southampton. The general impression among the good citizens of Chichester was, that either their own or their neighbour's chimneys had fallen. I myself was so convinced of it that I ran into every room of my house, in the full expectation that some chimney had fallen. A man who was digging in a chalk-pit, near Cocking, was killed by the fall of a mass of chalk loosened by the shock. The next shock, which occurred early in the morning, about three o'clock, on the 13th of Nov. last, was much more severe. Persons were universally awakened by it; and all describe their sensations, on awaking, as those of indescribable awe and terror. The shock was sufficient to cause the city clock, at the Cross, to strike, and bells in many houses to ring. The noise of this, and of all the other earthquakes, has seemed to me most to resemble that of a carriage rolling under a gateway. The next was on Jan. 23, of the present year, and was slighter than the two preceding. We had not felt any more of them till the one of last month, which seems to have been felt much more extensively. Dr. Burney, who sent the account which was republished in the Magazine, ascribes it to electrical agency; but I am at a loss to understand how any electrical discharge could affect a district upwards of 30 miles in length by 20 in breadth. The subject has caused much discussion here, and a sub-committee of our Philosophical Society appointed to investigate the matter; but, though we have *sat upon the earthquake* with much assiduity, we have hatched nothing as yet.

It is curious how coolly people take these kind of things, when they get used to them. For instance, a lady was just settling herself to sleep, after being dis-

y the shock, when her maid- rushed into her room, almost heir wits with terror, to inquire s the matter. "Only an earth- was the reply, "go to-bed We find strangers don't take vith such philosophical serenity, aving left in much precipitation, g to be swallowed up quick. I le at a distance very incredulous r Chichester earthquakes, assert- two of them are equal to one

H. WATSON.

er, October 21, 1834.

SYSTEM OF CALCULATION.

It is known to mathematicians, not generally to practical men, means of tables of squares and ds, all the operations of multi- and division might be as readily d as by logarithms; and that, ntly, by the assistance of the ines, tangents, and secants, the ons of trigonometry could as e made. The principle is this: *om the square of the half sum of bers, you subtract the square of ir difference, the remainder will product.*

ample: suppose it were required ply 157,339 by 29,945.

sum (93,642) squared is .. 8,768,824,164
difference (63,697) squared is 4,057,307,809

fference of these squares.. 4,711,516,355
roduct required.

ion could be performed in the anner, by using the reciprocal of isor as a multiplier; and the root would be found, of course, le inspection.

osing that we were in possession s of squares and reciprocals suffi- extensive, it is plain that the ns of arithmetic would be easier y logarithms. In the preceding e there would only be two sums ken out; whereas, in logarithms, les must be consulted three times. , no logarithm tables hitherto would give more than five or six of the product; while, here, there figures, and all accurate.

time when I had more leisure than I now have, I computed a set of tables, for the above-mentioned purposes. I was aware that, to be useful, they must not only be accurate, but *believed* to be so; and I constructed them on such a peculiar plan that any error, which might casually escape the printer, would be instantly observed, at the moment of consultation. Though containing the squares of all numbers up to 100,000, they would not occupy more than 200 octavo pages; and these, with the addition of tables of cubes, factors, sines, and tangents, &c., were designed for a thin volume. I beg, however, that you will not consider this as a puffing advertisement. The idea of publication has long been given up as hopeless; but, as I put some store in the *originality of the arrangement*, I shall be much obliged by your allowing me two consecutive pages of your next number, for the purpose of its exhibition and preservation.

Yours, B. D.

[We shall have much pleasure in reserving for our ingenious correspondent the space he requests for the exemplification of the excellent system of calculation which he has here brought under the notice of our practical readers.—ED. M. M.]

THE GERMAN PRESS.

Sir,—While the merits and originality of the system of bee-management, introduced by your correspondent, Mr. Nutt, are the subject of discussion in the pages of the Mech. Mag., it may not be out of place to remark, that our industrious neighbours, the Germans, have thought Mr. Nutt's work of sufficient importance to receive the honour of translation into their language. It appears in the last Leipsic catalogue, under the title of "Anweisung zur Luftungs-Bienenzucht," (Directions for the Ventilating System of Bee-management,) translated from the English by "the Pastor, W. Ch. L. Mussehl." Mr. Nutt was indebted to a clergyman for valuable assistance in preparing the original work; and, it seems, he is now under further obligations to "the cloth" for the introduction of his system to the German public. Nor is it, perhaps, beneath the dignity of their profession to spread far and wide the doctrine of "Humanity to Honey-Bees."

This said Leipsic catalogue exhibits

abundant evidence that the rage for penny periodicals is as strong in Germany as in England. It notices the completion of the second volume of "Das Pfennig-Magazin der Gesellschaft der Verbreitung gemeinnütziger Kenntnisse:"—a German version of our Useful Knowledge Society's Penny Magazine, with, we believe, impressions from stereotypes of the original cuts. In one respect, this reproduction is a decided improvement on the model. The supplements, which are devoted to lives of eminent men, are published under the very engaging title of "Das *Gratis* Magazin." This liberality ought to put our own Society to the blush;—far from supplying their supplements for nothing, they very often charge sixpence for a "part" comprising only five separate pennyworths,—a vile custom, and not to be compared with the laudable one of their continental brethren.

Besides this, there are now publishing a musical work, the "Pfennig Choral Buch," and a "Pfennig-Encyclopädie," (but not, apparently, translated from the English one)—one of whose chief attractions rests in its "steel-plates, *fully equal to the best English*,"—one proof among many of the decided superiority of our own engravers in that line of art. To these may be added, a "Pfennig Magazin der Anatomie," (of all things!) an "Universal German Penny Magazine," and a "Penny Magazine for Children." Besides all these, there are several reprints going on of popular works; and, among the rest, a penny edition of Bulwer's "Pilgrims of the Rhine," translated expressly from the English, and embellished with engravings on steel! Mr. Bulwer is decidedly the most popular of English living authors in Germany. The present catalogue includes numerous reprints and translations of his works, especially of "The Pilgrims of the Rhine," which seems to hit the moody taste of Mein Herr most completely; since, besides the cheap edition above noticed, no less than four other separate translations of the work have been published in various parts of the country.

I remain, Sir,

Yours most respectfully,

F. H.

London, October 23, 1834.

P.S.—I have forgotten to mention that at the end of the catalogue there is an advertisement for a Polish Penny Magazine, called "Przyiaciel Ludu" (The Friend of the People).

PLURALITY OF WORLDS.

If among the distant groups or systems of suns, the same equal description of areas, and the same ratio of periodic times are found to prevail, it seems reasonable to conclude that the stars of each system attract one another,—that the force by which they are attracted varies inversely as the square of the distance, and is therefore similar to gravity,—and lastly, that motion is there governed by the same laws as here. Now we do find this to be the case. The motions of double stars have been very accurately observed, among others, by Sir J. Herschel; and he has ascertained that their motion is subject to these laws. He has accurately determined the periodic times, the *axes majores*, and eccentricities of eight of them; and in every respect does he find the relations which exist between the planetary motions, to obtain among the bodies which compose these far remote systems. What, then, is the conclusion?—that all these multiplied and isolated systems which people space, and of which the universe is the aggregate, are subject to the same laws of motion and force as obtain here. Thus the laws of gravitation and motion, which Newton showed to embrace at once the fall of bodies at the earth's surface, and the phenomena of our planetary system, must be extended to the region of the fixed stars, and are universal. With us all matter is crowded with life; every interstice in it is but the habitat of some organized living agent, or the space wherein some form of vegetable life developes itself. Now the matter of the planetary bodies is analogous to ours in every other respect—why not in *this* too, that it is the appointed dwelling-place of organized living beings? and if of the subordinate classes of these, why not of intelligent living beings? Surely, in the absence of all evidence of an opposite state of things, we are bound to conclude by far the most probable supposition to be, that our planet, which is in every other respect a sample of the other bodies of our

, resembles them in this also: they, as ourselves, have their day and their summer and their winter , as with us, should not these s be coupled with the pheno- of animal and vegetable life? a prodigious field of specula- thus opened to our view! Mer- r instance, completes his year in ne quarter of ours, and he receives even times as much heat from the What, then, is the vegetation, and e class of living beings suited to id change of seasons and glowing ature? Jupiter's year is nearly of ours, and each of his seasons is ree years in length;—what gigan- tation is that which goes through some period of change? His day t ten hours long. What develop- animal life is that whose periods se come more than twice as fre- as our own? Four bright moons e the short night of this planet. this short period of repose bright- most into daylight?

f it be by far the most probable of hypotheses to suppose that the of our own system, because of logy they bear in other respects own planet, display with it the s of animal and vegetable creation must the planetary systems which tionably surround the stars, too, a direct analogy to those of our be admitted to be, like them, but ans, but the agents, in the disse- n of life through all space; thus boundless fields through which s of heaven take their course, are with beings who bow before speechless thanksgiving for the ent of the blessing of life, or privilege it is to offer to him the of reason and of the understand- *rofessor Moseley's Introductory on Astronomy.—Athenæum.*

. BURDEN'S SPECIFICATION.

lescriptions we have already given steam-raft, with which Mr. Bur- Troy (U. S.), has been recently ing such miracles of speed on dson, and of the vessel now build- a modification of the same plan, ton, in Upper Canada, have left lers little to learn respecting the principle of the new mode of construction introduced by Mr. Burden. We subjoin, however, for the sake of the practical details which it contains, a copy of Mr. Burden's own specification:*—

"To all whom it may concern, be it known, that I, Henry Burden, of the city of Troy, in the county of Rensselaer, and state of New York, have invented a new and useful improvement in the method of constructing steam-boats, and other vessels, whereby they are rendered capable of being propelled with greater velocity by the application of a given power, than any of those which have heretofore been constructed; and I do hereby declare that the following is a full and exact description of my said invention.

"It is an ascertained fact, that in order to lessen the resistance opposed to a solid body in its passage through a fluid, all that is necessary is to decrease it in its transverse section, and to give to it a proportionate elongation, and a proper curvature. It has not, however, been found practicable to carry this to a much greater extent than has already been done, whilst the hulls of vessels are constructed upon the plan of building ordinarily pursued. To take advantage of this principle, and to avoid the difficulties hitherto experienced in the attempt to do so, is the object of my invention, which I carry into effect in the following manner.

"I construct two, or any convenient number of barrel-formed floats, of great length in comparison with their diameter; these I prefer to make perfectly round in their cross section, tapering them from the middle towards each end, but leaving them curved longitudinally, in the manner of a barrel, and carrying to a point, or nearly so, at each end. These floats I form of staves throughout the greater part of their length, or until the interior diameter of the float becomes so small that it will merely admit a man to tighten the staves, the remainder thereof being of solid timber.

"When two such floats are used, I place them at such distance apart as to admit of the revolving of the propelling wheel between them; a suitable number of beams pass from one float to the other, to connect them together; which beams are hollowed at each end so as to fit the curvature of the floats,

* Mr. Burden, like all successful inventors, has already many imitators. "From the models which we have seen arriving at the Patent-office," says Dr. Jones, the superintendent, "we are apprehensive that young as Mr. Burden's boat is, it has already a numerous progeny, some of whom have taken the precaution to smut their faces, that their relation may not be at once apparent; however, when they are washed, and appear in their true colours, their affinity may become manifest."

and are fastened to them in a way to be presently described. Upon these beams the superstructure, containing the cabin, machinery, &c., is sustained.

"The staves of which the floats are made, must, in thickness, and in other respects, be proportioned to the size of the vessel. When the floats are of such a length that timber cannot be obtained sufficiently long to make the staves in one piece, I use two or more lengths, joining the ends by tongues and grooves, and taking care to break joints so as not sensibly to lessen the strength.

"As it is of vast importance that these staves should be forced together so as to be water-tight, without depending upon caulking, and that they may be drawn together at any time, without encumbering the surface of the float by hoops, or any similar contrivance, which, at the best, would answer the purpose very imperfectly, I make hoops, or rings, either of cast or of wrought iron, the outer diameter of which must be less than that of the interior of the float, in the parts where they are to be placed, and their interior diameters such as that a man can conveniently pass through and tighten the nuts which bear against them. Through each of these rings there are as many holes as there are staves to be drawn together. A bolt passes into them through each stave, its head resting thereon, being made sufficiently large, or having a suitable washer, or plate, under it to prevent its drawing through the timber. The inner end of each of these bolts is tapped, and furnished with a nut, by means of which the staves may be drawn towards the outward periphery of the hoop with any desired degree of force. There must be such a number of these rings, or hoops, as may be found necessary to render the staves perfectly tight; a point to be experimentally decided: I, however, esteem a distance between them of five feet to be such as will in general answer the purpose perfectly.

"The beams, or timbers, which connect the floats, are to be bolted thereon, there being solid blocks within the floats for the bolt-heads, or nuts, to bear against; the hollowing of the lower sides of these timbers forming a sort of saddle, by which they fit to and span over the top of each float.

"The length and diameter of the floats, the thickness of the timber employed therein, and the particular size and strength of the other parts, will depend upon the dimensions of the general structure, and the load to be carried, and may, in great part, be calculated upon known principles, although they must also, in part, be determined by experience. Without intending to confine myself in these particulars, I will here give the proportions that I have adopted in a boat which built on the foregoing plan.

"The floats are three hundred length, and eight feet in diameter centre; the number of staves is twe and their thickness three inches and

"Although I propose to give to th a round form, the principle upon wh are constructed will admit of thei varied in this particular, requiring o degree of curvature in their sectio will admit of their parts being draw ther by an internal apparatus of b screws, so as to form perfectly close As, however, the quantity of timber, portion to their capacity, the equal of the parts, and other important poi be best attained by a circular form, I this the preference.

"The drawings which are deposite Patent-office, with the written referenc unto annexed, will serve fully to il the various points to which allus herein been made.

"What I claim as my invention using of two or any other number o constructed upon the principles he forth, made of such size that the from their buoyancy, sustain the sup ture and load, answering in this res purposes of the hull of an ordinary for which they are substituted, but o much less resistance in their passage the water. I also claim the within d mode of drawing the staves, or pieces of such floats together, by n internal hoops and screws operating principle set forth; not intending to myself precisely to the mode of forn putting together the various parts, a in this specification, but to vary the any manner which I may find conveni which is in conformity with the gene ciple of procedure, and which produ logous results.

"HENRY BURI

RECENT AMERICAN PATENT

(Selected from the Franklin Journal for S

BRANCH PIPES FOR FIRE-EN *James Riley, Boston.*—Branch pi patentee states, are usually made o or other metal, and covered over wit or cord. Instead of using a metall he employs one made principally of but enclosing a wire wound spiral takes a rod of wood of the proper t size for the inside of the pipe, an larger end of it adapts a screw, wh fit the engine, and to the small en

receive the nozzle. He then sews leather round the rod, embracing in it the shanks of the two pipes. A tinned wire is then wound spirally upon this leather, from end to end; the wire may be about No. 9 or 10, and the coils about three-eighths of an inch apart. The wires are to be united to the leather by back-stitches, and the spaces between the turns filled with a composition of India rubber, spirits of turpentine, linseed-oil, and lamp-black. When this has been done, another covering of leather is to be put on and firmly fixed. The advantages to be derived from a branch pipe thus formed result from its flexibility, in consequence of which the water can be sent in directions which it could not receive from a straight pipe. When a hole has been cut through a roof, or when a fireman is standing upon a ladder, it is often impossible to direct the straight pipe effectually into the opening or window. "How difficult the task," says the patentee, "to attend to the fire, his footing, in changing from one side to the other, and his pipe; but these difficulties are completely obviated in this improved pipe; the holder commands every point of the compass, with the simplest ease, and without the necessity of moving his body; 'tis his protection from the raging flame, and though duty should call him to the midst of the furious element, his pipe is his shield," &c. &c. Notwithstanding this eloquent advocacy of a leather branch pipe, we are of opinion that one of copper, altogether inflexible, is to be preferred. We know something of branch pipes, by experience, and therefore speak with some confidence. Their flexibility would generally be a real disadvantage, in an attempt to direct the water to a particular point; and when they were wanted to be used in a curved form, the force of the water in passing through them would tend to straighten them; for a purpose such as the patentee has indicated, we should prefer to have a curved nozzle to screw on, which the engineer might carry in his pocket.

QUICK TANNING — *George Burr, New York.*—Take a common fulling-mill—put the hides into the trough along with the ooze or tanning liquor—beat them as you do woollen cloths while there immersed—renew the liquor as it becomes exhausted—and in a few hours (it is said) the hides will become perfectly tanned.

FEATHER-DRESSING MACHINE — *George Reynolds, Connecticut.*—This machine has, exteriorly, very much the appearance of a large cylindrical coffee-roaster. A cylinder of sheet iron, which may be three feet long, and eighteen inches in diameter, has a shaft through its centre, which revolves freely within it, and from which projects a number of pins that may be formed of wire, and of such length as nearly to touch the cylinder. The shaft is of wood, but iron gudgeons from its ends pass through the heads of the cylinder, and one of them receives a crank by which it is turned, the shaft lying horizontally. A door, extending the whole length of the cylinder, opens on one side of it, to admit and discharge the feathers. This machine is to be placed where a fire, the heat of which can be properly regulated, may be placed under it. The feathers to be dressed are first washed quite clean, and suffered to become half dry; they are then placed in the machine, and exposed to the action of a moderate heat, whilst the machine is made to revolve; in this situation they are to be allowed to become perfectly dry, which will be known by the ceasing of the issue of steam through small openings left in the heads for that purpose. It is said, that however dead and matted the feathers may have been, they will, by this process, be rendered quite lively; and whether old or new, they will be equally light, and deprived of every bad smell.

NEW AMERICAN SILVER—*John H. Haggenmacker. Philadelphia.*—The following are the ingredients employed, and the proportion in which they are to be used:—

Copper . .	3 lbs.	0 oz.
Silver . .		1
Zinc . .	1	4
Cobalt . .		½
Nickel . .		12
Manganese .		2
Tin . .		1
Iron . .		½

These materials are to be completely fused, when, it is said, 5 lbs. 5 oz. of the compound will be obtained; in this there must be some error, as the foregoing ingredients will not combine together without loss, more especially as one of the articles, the manganese, is added, we presume, in the form of an oxide, for it is not probable that the patentee has ever seen two ounces of it in the metallic state. The German silver, now extensively manufactured, and a beautiful substitute for the precious metal, is a compound of copper, zinc, and nickel. (Mech. Mag. vol. xv. p. 351.) The French also manufacture a metallic compound, which they denominate Mailleohort, that has a similar character, and according to its analysis consists of the same materials, with a trace of iron and of arsenic. The patentee, if he can sustain his patent, is confined to the proportions which he has indicated, and judging from the recipe, his composition does not possess any advantage over the combinations previously made.

NOTES AND NOTICES.

American Cotton Twist.—We have this week had shown to us a sample of cotton yarn, No. 22's Water-Twist, spun, as the ticket imports, by Collett and Smith, of the Hamilton factory, Paterson, New Jersey, which was purchased in New York for account of a manufacturing house in this town, and *has been laid down here at full three halfpence per pound less than it could have been bought for in this market.* The thread of the yarn is (apparently owing to an inferiority in the carding,) not so even as that of good English yarn of similar counts; but it is quite as strong, and appears to be made from a better quality of cotton. It is only fair to observe, that this yarn was probably purchased under the influence of the serious depression which the recent crisis in their monetary and banking system produced in the United States, and that the price of 22's water-twist there, has of late been decidedly higher than it was for some considerable time previously.—*Manchester Guardian.*

A new Theory of the Fall of Rome.—The Romans well understood that there could be no good and stable government in the countries they possessed, until they had established the best and most direct lines of communication; hence we find in Britain the remains of many of these roads, which are so many monuments both of their greatness and of their wisdom. Had the Romans possessed the use of railways, and known the power of steam, nothing on earth, short of internal discord, could have shaken the stability of their empire. In such a case, and possessed of such means, it is not too much to say it were even possible that three-fourths of the world would have been all Roman now.—*Report of H. H. Price, C. E., on the Railway from London into South Wales.*

Pin-heading.—The process of pin-heading, three establishments for which I visited, is carried on in the following way:—A large room is filled with small tables, at each of which sit 4 children; about 30 or 40 together in a room, and certainly of ages lower than I should suppose it possible could be employed in any other gainful occupation. The majority of those I saw did not appear to be above 7 or 8; and, in fact, the scene, as far as regards the ages of the children, reminded me more of an infant school than any thing else I had ever witnessed. A sort of frame is fixed before each child, on which is suspended a heavy weight, which is kept in perpetual motion by the child pressing its foot on a treadle beneath the table; and the continual thumping noise of which, close to the infant's ear, seems well calculated to produce the ear-ache, complained of by several witnesses. Each child is in a position continually bent in the form of the letter C, its head being about 8 inches from the table, and both its hands engaged in taking up the shanks and putting heads on them, which heads are then tightened by blows from the weight suspended before it. On the whole, the employment of pin-heading seemed to me the most irksome and monotonous, without exception, I had ever witnessed; and knowing the cruelties that are sometimes practiced at it, to keep their infants at work, I was not surprised at being told by a manufacturer, that he had been once engaged in the trade, but had left it, owing to the disgust he felt at this part of the business.—*Mr. Tuffnell's Report, Factory Commission.*

John Scott, chemist, late of Edinburgh, by his will, made in 1816, bequeathed the sum of 4,000 dollars, in the funded 3 per Cent. Stock of the United States, to the corporation of the city of Philadelphia, directing that the interest and dividend to become receivable thereon should be laid out in premiums, not exceeding 20 dollars, to be distributed among ingenious men and women, who make useful inventions; and that therewith should be given a copper medal, with this inscription—"To the most deserving." The Select and Common Councils of Philadelphia, by an ordinan 27th Feb. 1834, have transferred the awarding these premiums and medals to th lin Institute of Pennsylvan a, for the pro the Mechanic Arts.

Factory Life at Manchester.—It is i not to notice the total absence of public parks, and walks at Manchester; it is s the power of the factory workmen to breath of nature, or to look upon its verd this defect is a strong impediment to conv from disease, which is usually tedious an at Manchester. The medical police is als of much improvement. I believe that veliers are struck by the lowness of sta leanness, and the paleness which prese selves so commonly to the eye at Ma and, above all, among the factory classes never been in any town in Great Brita Europe, in which degeneracy of form a from the national standard has been so The married women fall remarkably shor usual characteristics of the English wife; in addition to the labour of twelve hou they have other cares which engross al undivided attention of married women, other classes of life.—*Dr. Hawkins' Rep tory Commission.*

Factories in Ireland.—The following Mr. Horner's Report to Lord Duncanno London, July 21, 1834:—Few factories a established in Ireland—only 34 in all, and of these on a small scale. It is remarka there is not a single woollen-mill, small and north of the county of Dublin no s exist. There are some considerable cotton and near Belfast; and recently some ve establishments for spinning flax have been and more are in progress. The total numbe sons employed in the factories subject to th the North of Ireland, is 5,395; of whom, 1 males and 1,440 females) are between 1 years of age; and 427 (170 males and 257 under 13; of these 427, only 47 are under of age. Hands are so plentiful, and la cheap, that mill-owners, at present, hav casion to employ any under 13. The "m moving power is equal to 1,280 horses, 733 are steam, and 547 water. It appears, same report, that the total number o woollen, silk, and flax factories, in Sco which the machinery is moved by steam-e water-wheels, amounts to 388.

A Subscriber, Rugby, should state whe with the theory he alludes to; we never it before.

If A. B., of Bristol, feels so certain tha chanical arrangement he mentions, "w the difference of leverage," by which the of Worcester asserted he had obtained tual moving wheel, he had better make i virtues, and then inform us of the result. to him will be small, and the saving to readers, in useless discussion, considerab

Communications received from T. borne—H. A.—Mr. Whatton—Mr. Fo —Mr. Tayler—An Old Subscriber—Phil —Mr. Aldersey.

The publication of the Supplement t Volume is, owing to an unavoidable del engraving of the Portrait of the late M deferred till the 1st of December.

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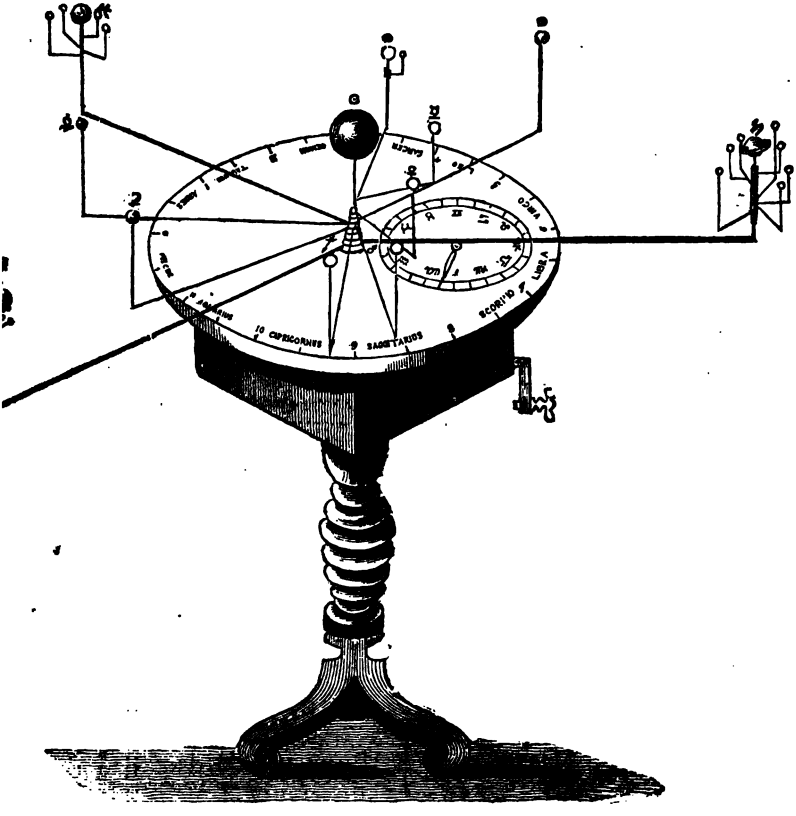
MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 587. SATURDAY, NOVEMBER 8, 1834. Price 3*d*.

FORRESTER'S IMPROVED PLANETARIUM.

Fig. 1.



FORRESTER'S IMPROVED PLANETARIUM.

Sir,—As I have occasionally turned my attention to the calculating of astronomical wheel-work, I read with some interest the description of a Planetarium invented by Mr. Henderson, given in No. 500 of your valuable Miscellany, but was considerably disappointed to discover that, both in respect of accuracy and simplicity, it fell far short of his professions, of "showing, *as nearly as possible*, with *single* wheel-work, the mean motion of all the planets round the sun."

In truth, Mr. Henderson seems to be ignorant of the application of continued fractions to the calculation of wheel-work: thus, in the movement of Vesta, if he had substituted wheels of 3 and 11 teeth, or any multiples, he might have saved his more circuitous calculation, which has nearly triple the error. In his treatment of Pallas, he is rather facetious; he is evidently displeased with the equality of its period to that of Ceres, because it would seem they require the same movement; to check its forwardness, therefore, he gives its wheel an additional tooth (no matter, it appears, whether that wheel be 7 or 70—a *tooth* it *must* have); and thus the difference of the periods, instead of being 5 hours, as it ought to be, is now, by this extraordinary contrivance, upwards of 576 hours!

So much for Mr. Henderson's attempts to improve the works of Nature!

The Planetarium invented by Dr. Pearson is, perhaps, more exact than any hitherto constructed, but in its wheel-work there are nine wheels, with more than a hundred teeth in each, some containing 166, 206, &c.; so that it may be desirable to have an instrument with more simple wheel-work, and still to possess considerable accuracy. I submit the following to your readers as an attempt to supply this desideratum, it having smaller wheels than Dr. Pearson's,* and being at the same time, I believe, on the whole, rather more exact.

The accompanying figure 2 is a section of the wheel-work, which will require a very brief description:—On the axis of the handle which drives the wheel-work is fixed a bevelled wheel of 18 teeth, driving that of 56; on this latter wheel is fixed the wheel 14, which drives one of 54, and this wheel 54 is fixed on the great axis, making a revolution in a year, in which time the handle makes 12 revolutions.

It must be observed, the wheels 56 and 14, which are fixed to each other, are not fastened to the axle carrying the pointer, but only revolve on it.

On the great axis are fixed the

Wheels
- 54, which drives 13, which is fixed on the the tube carrying Mercury.
- 52 ..... 32 ..... Venus.
- 50 ..... 50 ..... Earth.
- 42 ..... 79 ..... Mars.
- 29 ..... 106 ..... Vesta.
- 14 ..... 61 ..... Juno.
- 15 ..... 69 ..... on the same tube, Ceres and Pallas.
- 7 ..... 83 ..... Jupiter.

The wheel 83, on Jupiter's tube, drives 67, on which are fixed the

Wheels
- 27, which drives 83, fixed on the tube carrying Saturn.
- 12 ..... 105 ..... Uranus.

The wheel 50, on the great axis, drives another wheel of 50, the axis of which passing through the upper frame, carries an index which points out the day of the month and the sun's longitude, it may also show his Right Ascension and Declination, also the Equation of Time.

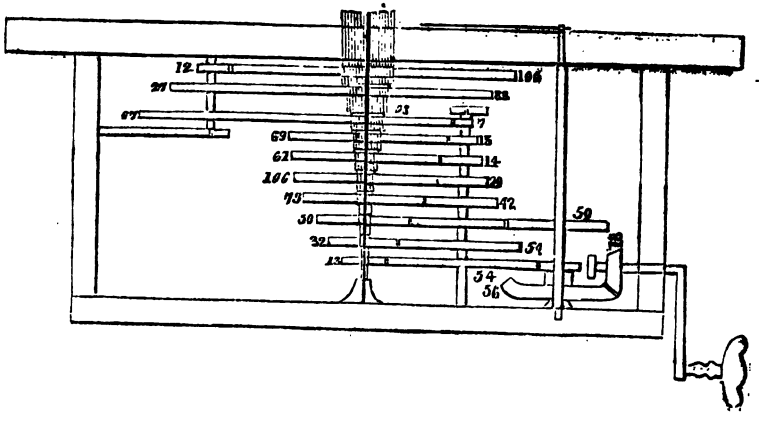
Fig. 1 is an isometrical drawing of the whole machine, as it appeared on the 1st January, 1834.

I have subjoined a table of the errors of this improved Planetarium, and contrasted them with those of Mr. Henderson's, taking the periods from La Place's "Système du Monde," as given in Barlow's Tables.

	IMPROVED PLANETARIUM.				MR. HENDERSON'S.			
	Days.	*h.*	*m.*	*sec.*	*Days.*	*h.*	*m.*	*sec.*
Mercury	.. 0	57	14		.. 1	0	7	
Venus	.. 1	39	20		.. 1	39	20	
Earth	—	—	—	—	—	—	—	—
Mars	.. 1	46	1		.. 6	34	53	
Vesta	.. 0	10	13		11	0	18	52
Juno	.. 16	37	18		.. 20	12	34	
Ceres	1	2	13	25	1	2	13	25
Pallas	1	7	5	16	23	1	17	59
Jupiter	.. 2	51	36		.. 2	51	36	
Saturn	.. 2	34	16		27	21	56	18
Uranius	.. 7	4	17		91	0	22	56
Sum of errors	3	18	58	56	155	10	28	0

* *I allude, of course, only to his* Planetarium with two wheels to each movement, not to his larger *Planetariums and Orreries.*

Fig. 2.



It will be seen from the above table
rrors, that this machine is competent
only to give a general idea of the
ar System (which is all that is in ge-
l attempted in Planetariums), but
that, when once adjusted, it will
v the mean places of the planets for
umber of years, without sensible
r, and is thus of considerable use to
practical astronomer. But its utility
re considerably circumscribed, by an
sion, common, I believe, to all Pla-
iums and Orreries; viz., that though
point out the month, and day of the
h, and in some instruments the hour
e day, yet none of them record the
of the *year* in which the different
omena occur. The idea of remov-
his imperfection in astronomical
ines, I do not claim as original;
an Orrery constructed by my father,
hich he had the honour to receive
the Society of Arts their gold
l, value 10*l.*, the date is recorded
e machine, it being shown by four
rs moving round a dial-plate; thus
sing the power of registering up to
), so that the machine may be
to *an unlimited extent* without
ng to be re-adjusted.

By the addition of only three wheels to the Planetarium above described, it may be made to record the years to a sufficient extent for all practical purposes. There might likewise be added the moon's motions sufficiently exact to show her phases, the times of new and full moon, &c.; and, by giving the nodes their motion, to predict and explain eclipses: the earth's axis could likewise be made to keep its proper angle, and thus illustrate all the phenomena of the seasons.

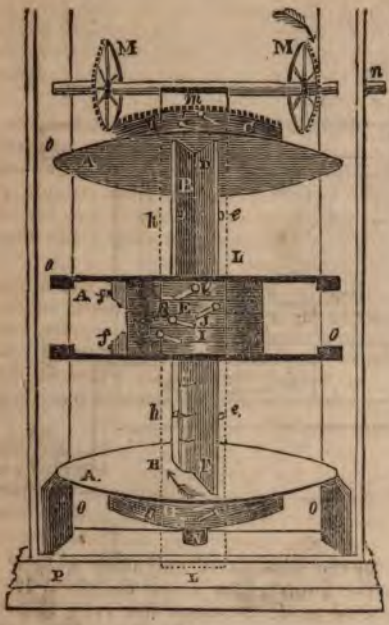
I have refrained from entering into a description of the wheel-work producing these motions, as I fear I have already trespassed too much on your valuable space, and therefore beg to subscribe myself,

Yours respectfully,

WILLIAM W. FORRESTER.

Kirkcaldy, Fifeshire, Scotland.

DESIGN OF A ROTARY-ENGINE.



Sir,—The above sketch is a design for a rotary-engine, without either fly-wheel or valve. I had almost resolved on my plan when S. D.'s appeared in your Magazine; and from the objections made to his plan by the intelligent Mr. Murdoch, I was induced partially to alter mine.

A A A A are four flanges of two separate cylinders, which are not represented, that the interior may be seen. B D F H are four flaps, or revolving pistons. C E I G are four wheels, or rims connected with the flaps. B is connected with C, D with E, F with G, and H with I, by their central parts *a a* extending through the flanges. J J J are three rims connected with the main spindle N; the cogs on the upper rim put in motion the cog-wheels M M. K K are two rims (of which there are altogether four of sufficient depth to allow room for packing) connected *with the flanges*; a portion of the other *two rims may be* seen at top and bottom; *two have the* palls hinged to them, and allowed to drop, the one i and the other into G; while, o gravity, the other two are hin C and I, that they may drop i other two rims K K, which wi the abutments as the flaps come *i i i i* are four plates fastened to t J J J: *f f* are two blocks, faste the rims K K, of which blocks course, will be required. It sho understood that the rims J J J in constant motion, so that the *i i i i* will pass in the clear of the *f f*, and force a strong pin, atta the top of each plate by a sprin the rims of the flaps, which wi them past the steam apertures. flaps are put in motion in the shown, the flap of the one w have the effect of bringing the past the steam apertures. H moving in its full power, while B be in their weak part; and, *vic* A cross-beam *m* is intended to rec spindle N. The dotted lines L L r the upright connected with *m*. M cog-wheels connected together, lowed to move longitudinally spindle *n*, to reverse the gear or *e e* are the apertures of the exi If the steam is admitted at th tures *h h*, motion will be given direction of the lower dart, and communicated to the cog-wheels the direction of the upper da whence it may be transferred. Th marked O are fastened to the for the support of the cylinders.

This, sir, is the first time I e tured to communicate my expe to any one, and I shall feel honoured if you may consider worthy of a place in your usefu zine; and shall, too, be most to any of your able correspond their opinions, since I have n who can furnish me with instru mechanics.

A WELC

Pembrokeshire, March 10, 1834.

THE CASE OF THE POOR WO COLLIERS.

Sir,—In your excellent publi August last year, a letter app "the case of the poor working

signed "Humanitas." In this communication your intelligent correspondent has ably and feelingly pointed out the fatal accidents to which this useful and industrious class of men were then, and it is to be lamented are still, exposed. Since the appearance of his letter the subject has excited the attention of many scientific persons, has been noticed in the House of Commons, and will no doubt early in the next session be brought under legislative investigation, Mr. Pease, one of the members for the county of Durham, having given notice of his intention to move for a committee for that purpose. It may be some satisfaction to your correspondent, and to yourself, to know that his letter has been of some service in this matter, and that if he, or any of your readers, can furnish, through the medium of the Mech. Mag., a list of most or some of the principal accidents which have taken place from explosions of fire-damp, in the coal-pits of Durham and Northumberland, since the year 1810, such information would, in all probability, be of great service to the cause of the poor working colliers.

Your obedient servant,

And constant reader,

U. G. R.

London, Nov. 1, 1834.

MR. PERKINS' HEATING APPARATUS.

Sir,—In the Mechanics' Magazine of the 26th inst., a communication appeared, signed "J. Murray," which condemns an improvement for heating which has been patented by me: I beg, therefore, you will do me the favour to insert the following reply.

Mr. Murray hopes that he "shall not be stigmatised as an enemy of discovery and improvement, if he does not recommend what he cannot conscientiously approve." He then attributes to the invention a property which it does not possess, and frightens himself with the apparition.

He says that he cannot be satisfied that, if pipes charged with "*red hot*" water should accidentally burst, the danger would be trifling. Had Mr. Murray inquired of me, I could have proved to him how absurd is the supposition, that *red hot water* can be made to circulate in iron tubes under pressure. For I would ask Mr. Murray what must be the thickness of *red hot iron tubes* to resist a pressure of one thousand atmospheres, which is about the calculation for water heated to nine hundred degrees Farenheit?

The fact that water of that temperature must be confined in a tube made of material of sufficient tenacity, when red hot, as to resist such a great pressure, is enough to show the impracticability of circulating water at any thing like that degree of heat.

But let us suppose that we had a material which would contain water of the temperature of 800 or 900 degrees, and that the tube under that pressure and heat were to burst, what would be the temperature of the water one foot from the fissure?

Has Mr. Murray yet to learn, that the higher the temperature of water within the tube, the more suddenly is the heat abstracted when allowed to come in contact with atmospheric air, and consequently that the water would not scald? If, however, he will call at the National Gallery of Practical Science, he may at any time see this fact exemplified, and with perfect impunity hold his hand in steam, which issues from the generator of the steam gun, at a pressure of thirty atmospheres, and a temperature of 450 degrees. So much for the danger of small tubes, supposing they do burst.

Having thus disposed of the absurd idea that we circulate *red hot water*, I will endeavour to show that, notwithstanding we calculate for heating our pipes to 350 degrees, there need not be any oxidation. For this is completely prevented by covering the exposed pipe with a coat of Brunswick black.

But Mr. Murray will be better satisfied by examining facts. I can refer him to situations where pipes have been at work three years, subject to all the atmospheric influence to which he alludes, and yet no perceptible deterioration has taken place, either internally or externally. No one will deny that wrought iron will rapidly decompose, if not properly protected. In fact, I be-

lieve common gas-pipe, when in the damp ground, will only last twelve years before it must be renewed. This, however, is subject to wear internally as well as externally. But pipes used for heating purposes need not be exposed, and therefore can easily be protected.

If Mr. Murray had examined the subject previously to submitting his opinion to public observation, he would have saved himself the mortification of having done his best to retard the progress of a discovery which has obtained too great an impetus to be stopped.

It is fortunate that noblemen and gentlemen of fortune attend now more than they formerly did to matters of science. This it is that gives encouragement to practical experimentalists, and enables them to produce results to which they would never arrive were they entirely dependent upon such doubtful encouragement as is given by Mr. Murray.

Thus it was with the introduction of gas. A chemical lecturer of the day said that gas could never be used for lighting the streets—it was dangerous, &c. However, thanks to a spirited community, we are now in full possession of the luxury.

The time will come also, when Mr. Murray will acknowledge that not only will our houses be warmed by pipes hermetically sealed, but our bread will be baked, our coffee roasted, and many other things which are now imperfectly done, without the least apprehension from the *bugbear* pressure.

I am, Sir,

Your obedient servant,

A. M. PERKINS.

21, Great Coram-street,
Oct. 29, 1834.

NEW MODE OF CATCHING FISH.

Take a long rod, of the form of the ordinary fishing-rod, with a number of small rings as they are usually placed. At the end of the rod let there be fixed three long narrow wires, which are to expand at equal distances from each other, and be attached to the edge of a large circular ring, in which the fish are to be taken by means of a net, which is *made fast to the* circumference of the ring, and kept in its proper form by a piece of lead in the centre. Another ring of nearly the same dimensions, and also filled with a net, is to be placed immediately *above* the other, but kept about 2 *feet distant*. Some wires are to form the means of their communications, so as that the upper one, when held suspended by the fisherman, may descend in a moment on the fish, and enclose them.

The upper ring is to be a trifle less than the other, that it may *fit into* it when it touches it. In the middle of the upper net a piece of twine is to be fixed, which is caused to pass to the hand between the small rings before mentioned. Of course it wholly regulates the time of its falling. The end of this twine, or fishing-cord, is *drawn in* when the net is raised, and let out by a spring when it descends. Fish may be taken quicker by this means than any other thing of the sort in use.

A.

TABLES OF SQUARES AND SQUARE ROOTS.

Sir,—Referring to the kind permission in your Magazine of last week,* I here with send you two consequent pages, being a *century* of my Table of Squares. The left hand column (the second page being a continuation of the first) gives the figures of the Root for a hundred successive numbers, which, in the present case, rise from 3600 to 3700. In this manner the Roots are arranged, in the natural order, from 1 to 10,000: every two confronting pages containing an additional hundred.

The second column gives the first four figures of the square of each of the adjoining Roots (the 1 at the top being prefixed to all the succeeding numbers), and the last four are to be found in the right hand marginal column. Thus, if we want the square of 3639, we shall find, opposite to 3639 in the first column, 1324 in the second; to which joining 2321, found on the same horizontal line in the right hand marginal column (headed *Terms*, for *terminations*), we have 13242321, which is the square of 3639.

The same pages show the squares of all numbers between 3600 and 3700,

* Page 91.

each of the nine digits prefixed. the square of 13639 has its first five s (18602) on the same horizontal ith that of 3639, in the third co- headed 10,000; while its terminat- our figures are also found on the horizontal line in the right hand n (being 2321, the same as in the ; of 3639), making altogether 2321. In a similar manner, the x figures of the square of 23639 and in the column headed 20,000; st six of the square of 33639 are in the column headed 30,000; o on to the square of 93639, the x figures of which are found in the n headed 90,000; while, in all cases, the terminating figures are right hand column, and invariably me.

recapitulate:—

square of	3639 is	13242321
——	13639 is	186022321
——	23639 is	558802321
——	33639 is	1131582321
——	43639 is	1904362321
——	53639 is	2877142321
——	63639 is	4049922321
——	73639 is	5422702321
——	83639 is	6995482321
——	93639 is	8768262321

Square Root of a number is found ersing the operation: looking for arest square in the body of the and from thence referring hori- ly to the left hand column for its prefixing a figure according to the n in which the square is found. independent of their use in other etical operations, these two pages n 1000 Squares with their Roots: which Roots extend to four, and five places.

construction of the Tables was ned wholly by simple addition. ample, the upper horizontal line ares, opposite to the Root 3601, nown from the bottom line of the ing page, we proceed to find the ating figures marked in the right narginal column, and correspond- each successive Root in the left. ppermost four, opposite to 3601, 01 (twice 3600+1); and to these 7203, which, discarding the last g figure, gives us 4404, for the rminating *figures of the* square of 3602. To these last found figures we add 7205 (being 2 more than the last addition), which gives 1609 for the terminating figures of the square of 3603. In the same manner all the other terminations are found, by the continued addition of numbers that thus increase in Arithmetical Progression with the ratio of 2.

The other columns, also, are each filled up by a fixed progressive increase. The second column, for example, increases regularly by unity, as 1296, 1297, &c., except where the first of the four terminating figures (in the last column) increases; in which cases, the numbers in the second column are repeated. Thus, we have 1298 followed by 1298; because the corresponding terminations, 1609 and 8816, have the first figure 8, of the latter, higher than 1, the first figure of the former *term.* In every other case the increase goes on by unity,

The third column (headed 10,000) increases regularly by 3; except in the same cases as those above mentioned, when the increase is only 2. The fourth column increases by 5; except as before, when the rate of increase is only 4. The fifth column increases by 7, and the exceptions by 6. The sixth column increases in a similar manner, by 9 and 8; the seventh by 11 and 10; the eighth by 13 and 12; the ninth by 15 and 14; the tenth by 17 and 16; and the eleventh, headed 90,000, has its regular increase 19, and its exceptions 18.

Besides those columnar series, the lines, counted horizontally, will each be found to increase in an obviously regular progression; so that, on the whole, such a system of checks is established as must ensure that accuracy without which the Tables would be worthless.

At some future period I may, perhaps, solicit your insertion of a sample of some other of my *Arithmetical Tables*; but, at present, I fear that I may have intruded too much on your pages, as well as on the patience of your general readers. To those who love to trace the peculiarities arising from the arrangement of numbers, the specimen now given will not be unacceptable.

I am, Sir,

Yours respectfully,

DAVID BOOTH.

Charlotte-street, Bloomsbury,
Nov. 5, 1834.

Roots.		10,000	20,000	30,000	40,000	50,000	60,000	70,000	80,000	90,000	Terms.
3601	1296	18498	55700	112902	190104	287306	404508	541710	698912	876114	7201
02	297	501	705	909	113	317	521	725	929	133	4404
03	298	504	710	916	122	328	534	740	946	152	1609
04	298	506	714	922	130	338	546	754	962	170	8816
05	299	509	719	929	139	349	559	769	979	189	6025
06	300	512	724	936	148	360	572	784	996	208	3236
07	301	515	729	943	157	371	585	799	699013	227	0449
08	301	517	733	949	165	381	597	813	029	245	7664
09	302	520	738	956	174	392	610	828	046	264	4881
10	303	523	743	963	183	403	623	843	063	283	2100
11	303	525	747	969	191	413	635	857	079	301	9321
12	304	528	752	976	200	424	648	872	096	320	6544
13	305	531	757	983	209	435	661	887	113	339	3769
14	306	534	762	990	218	446	674	902	130	358	0996
15	306	536	766	996	226	456	686	916	146	376	8225
16	307	539	771	113003	235	467	699	931	163	395	5456
17	308	542	776	010	244	478	712	946	180	414	2689
18	308	544	780	016	252	488	724	960	196	432	9924
19	309	547	785	023	261	499	737	975	213	451	7161
20	310	550	790	030	270	510	750	990	230	460	4400
21	311	553	795	037	279	521	763	542005	247	489	1641
22	311	555	799	043	287	531	775	019	263	507	8884
23	312	558	804	050	296	542	788	034	280	526	6129
24	313	561	809	057	305	553	801	049	297	545	3376
25	314	564	814	064	314	564	814	064	314	564	0625
26	314	566	818	070	322	574	826	078	330	582	7876
27	315	569	823	077	331	585	839	093	347	601	5129
28	316	572	828	084	340	596	852	108	364	620	2384
29	316	574	832	090	348	606	864	122	380	638	9641
30	317	577	837	097	357	617	877	137	397	657	6900
31	318	580	842	104	366	628	890	152	414	676	4161
32	319	583	847	111	375	639	903	167	431	695	1424
33	319	585	851	117	383	649	915	181	447	713	8689
34	320	588	856	124	392	660	928	196	464	732	5956
35	321	591	861	131	401	671	941	211	481	751	3225
36	322	594	866	138	410	682	954	226	498	770	0496
37	322	596	870	144	418	692	966	240	514	788	7769
38	323	599	875	151	427	703	979	255	531	807	5044
39	324	602	880	158	436	714	992	270	548	826	2321
40	324	604	884	164	444	724	405004	284	564	844	9600
41	325	607	889	171	453	735	017	299	581	863	6881
42	326	610	894	178	462	746	030	314	598	882	4164
43	327	613	899	185	471	757	043	329	615	901	1449
44	327	615	903	191	479	767	055	343	631	919	8736
45	328	618	908	198	488	778	068	358	648	938	6025
46	329	621	913	205	497	789	081	373	665	957	3316
47	330	624	918	212	506	800	094	388	682	976	0609
48	330	626	922	218	514	810	106	402	698	994	7904
49	331	629	927	225	523	821	119	417	715	877013	5201
50	332	632	932	232	532	832	132	432	732	032	2500

Roots.		10,000	20,000	30,000	40,000	50,000	60,000	70,000	80,000	90,000	Terms.
3651	1332	18634	55936	113238	190540	287842	405144	542446	699748	877050	9801
52	333	637	941	245	549	853	157	461	765	069	7104
53	334	640	946	252	558	864	170	476	782	088	4409
54	335	643	951	259	567	875	183	491	799	107	1716
55	335	645	955	265	575	885	195	505	815	125	9025
56	336	648	960	272	584	896	208	520	832	144	6336
57	337	651	965	279	593	907	221	535	849	163	3649
58	338	654	970	286	602	918	234	550	866	182	0964
59	338	656	974	292	610	928	246	564	882	200	8281
60	339	659	979	299	619	939	259	579	899	219	5600
61	340	662	984	306	628	950	272	594	916	238	2921
62	341	665	989	313	637	961	285	609	933	257	0244
63	341	667	993	319	645	971	297	623	949	275	7569
64	342	670	998	326	654	982	310	638	966	294	4896
65	343	673	56003	333	663	993	323	653	983	313	2225
66	343	675	007	339	671	288003	335	667	999	331	9556
67	344	678	012	346	680	014	348	682	700016	350	6889
68	345	681	017	353	689	025	361	697	033	369	4224
69	346	684	022	360	698	036	374	712	050	388	1561
70	346	686	026	366	706	046	386	726	066	406	8900
71	347	689	031	373	715	057	399	741	083	425	6241
72	348	692	036	380	724	068	412	756	100	444	3584
73	349	695	041	387	733	079	425	771	117	463	0929
74	349	697	045	393	741	089	437	785	133	481	8276
75	350	700	050	400	750	100	450	800	150	500	5625
76	351	703	055	407	759	111	463	815	167	519	2976
77	352	706	060	414	768	122	476	830	184	538	0329
78	352	708	064	420	776	132	488	844	200	556	7684
79	353	711	069	427	785	143	501	859	217	575	5041
80	354	714	074	434	794	154	514	874	234	594	2400
81	354	716	078	440	802	164	526	888	250	612	9761
82	355	719	083	447	811	175	539	903	267	631	7124
83	356	722	088	454	820	186	552	918	284	650	4489
84	357	725	093	461	829	197	565	933	301	669	1856
85	357	727	097	467	837	207	577	947	317	687	9225
86	358	730	102	474	846	218	590	962	334	706	6596
87	359	733	107	481	855	229	603	977	351	725	3969
88	360	736	112	488	864	240	616	992	368	744	1344
89	360	738	116	494	872	250	628	543006	384	762	8721
90	361	741	121	501	881	261	641	021	401	781	6100
91	362	744	126	508	890	272	654	036	418	800	3481
92	363	747	131	515	899	283	667	051	435	819	0864
93	363	749	135	521	907	293	679	065	451	837	8249
94	364	752	140	528	916	304	692	080	468	856	5636
95	365	755	145	535	925	315	705	095	485	875	3025
96	366	758	150	542	934	326	718	110	502	894	0416
97	366	760	154	548	942	336	730	124	518	912	7809
98	367	763	159	555	951	347	743	139	535	931	5204
99	368	766	164	562	960	358	756	154	552	950	2601
3700	369	769	169	569	969	369	769	169	569	969	0000

EXPEDIENCY OF MAKING THE FORMATION OF RAILWAYS A GOVERNMENT UNDERTAKING.

Sir,—That iron railroads will be the exclusive mode of conveyance in this country, is a point which the national mind now begins to view with complacency. It was not so some thirty years since, when this subject first engaged my attention. We are now in danger, at the outset of this national improvement, to fall into the same error that the statesmen of that day committed, when the turnpike system was first introduced—then, as now, it was committed to the hands of private speculation;—then, as now, private, and, as far as the nation was concerned, irresponsible individuals were the persons engaged in its execution. It was a matter of trade. Then, as now, local interests were the only sources from which emanated the improvement of what should have been the work of responsible national agents;—hence Acts of Parliament were obtained for districts, and local interests were alone consulted. Then, as now, authority was given to levy tolls, to pay large interest on the capital laid out, and it became necessary to pass Acts of Parliament by thousands. Nay, reader, start not at this, for the fact is really so; thousands of Acts of Parliament were the result of this patch-work system.

It is to call up attention to this very important subject I now solicit a corner in your excellent Miscellany; and whilst you are amusing us with the lucubrations of a Badnall, a Cheverton, &c.—amusing, sir, did I say—rather, would I add, instructed and amused as we have been in this "war of words," which has been maintained by each with so much credit to themselves—I trust you will allow me (what surely is not less important) to inquire with whom should originate the formation of a work second to none in its bearings on the internal resources of the country?

To fall again into an error similar to the one fallen into by the statesmen of former days, about our turnpike-roads, would in this instance be more than error; it would be at once a calamity, and our country's disgrace; and that both these will be the result of placing the iron railroads in the hands of separate trusts, and *at the control or disposal* of separate, and in some cases, as we have already seen, conflicting interests, I am prepared, I think, fully to demonstrate.

My proposition, therefore, in order to put this question on its trial, which I shall feel much obliged by your giving a place to, is this:—

That, to provide the means of internal communication, or, in other words, *to make and maintain Public Roads and Canals is the legitimate and proper business of the Government of this country.*

If I can establish this proposition, then the mode in which we are proceeding with our iron railroads is obviously improper, injurious, and opposed to the interests of the public. I wish at this time to avoid detail; but, sir, take the present Birmingham and London railroad as a case. Could not Government borrow the two or three millions wanted for this road at *less than* 3 per cent. The Birmingham and London Company are authorised by their Act to levy tolls to the extent of 10 per cent.; thus forming a perpetual annuity, charged upon the public, of 7 per cent. more than they would have to pay if the monies had been provided by the public themselves, through the Government.

I leave this with you for insertion, relying upon your usual candour.

I am, Sir,
Your obedient servant,
WM. BOWSER,

Parsons-street.

[Were the question merely one of pounds, shillings, and pence, the proposition of our correspondent might hold good; but there is another thing, of quite as much importance as money, to be taken into account, and that is the evil tendency of increasing the power, of an already too powerful and not sufficiently responsible Government. Seven per cent. is but a trifle to pay, at any time, for keeping a work of public utility out of the hands of a jobbing Administration.—ED. M. M.]

PAPER-MAKING.

Sir,—Your correspondent Enort has somewhat misunderstood me, when I said that shavings had fallen into disuse—I meant to speak comparatively; and that I was justified in making the assertion will be evident, when it is remembered, that although wholesale collectors are now giving 18*l.* per ton for fine shavings, it is not many years since they were eagerly bought up at 32*l.* It is true, rags were then higher in prices than they are now; but the relative value of shavings, as compared with

vas very much higher than at this

n fully aware that Indian corn- and a great many other sub-, may be used for making paper, iple maceration in the engine, t undergoing any previous "fibrat- ocess;" but in that state they will d much to the strength or sightli- the fabric.

s a very common thing to find entering largely into the compo- of the cheapest kinds of "small where it is employed in the way uggests, viz. by simple maceration. examining such paper, it will be at the particles of straw exist in and sizes exceedingly unfavour- or improving the quality of the besides which, they are very im- ly incorporated, and add little to per beyond mere weight. Straw ble, however, of being separated ne fibres, in which state it would ntimately with the other compo- arts of the pulp, and make a wiry paper.

l some ready and economical of *fibrating* can be discovered, the vantages of the materials in ques- ill never be fully obtained; the t offers a wide field for the exer- ingenuity, and the investigation th the serious attention of some manufacturer.

I remain, Sir,
Yours truly,
WILLIAM BADDELEY.

1, 1834.

E BONES COLOURED BY FOOD.

reating of the subject of ossifica- a vertebrated animals, Dr. Roget, Bridgewater Treatise on Animal egetable Physiology, mentions a s fact. It has been found, that by certain colouring substances with d of animals, the bones will soon e deeply tinged with them. The as discovered accidentally by Mr. er, who gives the following ac- of the circumstance which led o notice it. Happening to be with a calico-printer on a leg of pork, he was surprised that the instead of being white as usual, of a deep red colour; and on in- into the *circumstances*, he learned that the pig had been fed on the refuse of the dyeing vats, which contained a large quantity of the colouring substance of madder. So curious a fact naturally attracted a good deal of attention among the physiologists, and many experiments were made to ascertain the time required to produce this change, and to determine whether the effect was permanent, or only temporary. The red tinge was found to be communicated much more quickly to the bones of growing animals than to those which had already attained their full size. Thus the bones of a young pigeon were tinged of a rose colour in 24 hours, and a deep scarlet in 3 days; while in the adult bird 15 days were required merely to produce the rose colour. The dye was more intense in the solid parts of those bones which were nearest to the centre of circulation, while in bones of equal solidity, but more remote from the heart, the tinge was fainter. The bone was of a deeper dye in proportion to the length of time the animal was fed upon the madder. When this diet was discontinued, the colour gradually became more faint, till it entirely disappeared.

MEANS OF PREVENTING ANCHORS FROM DRIVING.

Sir,—We often hear of ships being driven on to a lee-shore, in consequence of their anchors not holding, either from the too great hardness, or, more frequently, the softness of the ground. From the latter cause, I have seen several vessels stranded in the Bay of Naples, and in that of Toulon. I have often turned my thoughts towards the finding of a remedy for this evil; but no modification of the structure of anchors that I have seen, or can devise, appears to be of any avail. Not long since I had an opportunity of trying some experiments with a barge on an inland canal, with seven feet water, and a bottom of soft black mud. I used a chain, and a small anchor or "grappling," of the size usually employed in such barges. Taking advantage of the wind being in the direction of the canal, casting in the anchor, I set up a sail, and the barge was propelled astern, dragging the anchor through the mud. When the barge had once began to move, its way be-

came rapidly accelerated, in consequence of the anchor being lifted out of the mud, and sliding more upon its surface. I then took some iron weights, and making a coil of hoop iron, or of small bar iron, attached to it a weight, and put it on to the chain, as a key or a seal is put upon a split ring. The weight sliding down to the anchor, brought up the barge; or if one did not suffice, I sent down another.

Now, sir, it strikes me, that a ship of any size, situated as above supposed and instanced, would have the means of arresting the "driving" of its anchors, by having recourse to an expedient of the nature I propose. With respect to men-of war, a few of their guns might be quickly made available to the saving of the vessel. Most merchantmen are provided with two or four guns; and when they have none they might send down the caboose, or strong hogsheads full of ballast or of coals. When the bottom is mud, sacks would do as well as hogsheads.

Should you condescend to give a place in your valuable work to this crude communication, both you and I may perhaps, one day or other, have the satisfaction of hearing that it has produced some good.

I have the honour to be,

Sir, your obedient servant,

F. M.

London, Oct. 26, 1834.

MESSRS. MAUDSLAYS AND CO.'S STEAM-CARRIAGE.

Sir,—Allow me to inform your correspondent, A. S, that the steam-carriage he alludes to, at page 37, was not built by *the* Messrs. Maudslays, but was constructed under the exclusive direction of *one individual* of the firm of Messrs. Maudslay *and Company*. A. S. is in error as to the weight, and also as to its being an "incurable failure," for the machine made several journeys; nay, more—after some persuasion, the most talented member of the firm was induced to ride upon it. I confess I have been credibly informed (I was not there to see) that he did not exhibit any remarkable anxiety to remain on the vehicle, but was the first to get clear of it when it stopped; but the even proved that this arose merely from a nervous apprehension of imaginary danger, for the boiler did *not* burst, nor did the machine do any damage that I know of.

Yours, &c.

S. Y.

Oct. 27, 1834.

ON THE POPULATION OF THE EARTH.

Sir, There is a very interesting calculation at page 10, Mech. Mag., 4th Oct, 1834, on the population of the earth; perhaps some of your able correspondents may carry this a little farther. Let us suppose the increase of population to continue in the same ratio; then, how many years must elapse before the day of judgment, supposing this awful event to take place when there shall be as many to be judged as will occupy the whole surface of the earth, supposing it a complete sphere, and allowing one square foot to each person.

Your obedient servant,

LICTOR.

THE FORCING SYSTEM APPLIED TO TANNING INJURIOUS.

Sir,—I have just read, in your last number, that a Mr. G. Burr, of New York, has recently taken out a patent for the expeditious tanning of hides, which he promises, through the medium of forcible action, to be afforded him by the vigorous powers of a fulling mill, to be able to bring into a finished state of manufacture in a few hours; while, under the old system, it would have taken, according to the calculation of experienced tanners, a period of ten or twelve months to convert a stout ox-hide into a thoroughly tanned article. I here allude to a period antecedent to the introduction of the *hot liquor and vitriol forcing process*, which originated under the fostering influence of greedy government contractors during the late war, and has almost banished good tanned leather from the market. I am happy to say, however, that the most extensive and successful experimentalists of the *vitriol*

school have, of late, received a serious check. The leather produced by this artificial class of tanners no longer sells so readily as it did; the shoemaker having at length awakened to a conviction, that to furnish his customers with a good and durable article is the surest way to benefit himself. To revert, however, to the immediate subject of this letter, I cannot see how our brother across the Atlantic, by the new and rapid process of tanning which he has announced, will be able to bring his experiments to a sound and profitable issue, as by urging a too quick incorporation of the animal and vegetable juices (which he must do, according to the method he has explained), he will be compelled to force out a great proportion of the former, *i. e.* the vitality of the hide, which ought to be preserved as much as possible, to confer weight and firmness on the manufactured article.

Plans have been brought forward in this country, as well as America, for expediting the process of tanning, but I have never heard of much success attending any of them. By applying a moderately stimulating warmth to the article while in the pit, the process may, no doubt, be a good deal accelerated; but all aid from such noxious articles, as vitriol, &c., ought to be reprobated, and even prohibited by Act of Parliament. By-the-bye, I should like to know what good has resulted by Government foregoing the last duty of 1½*d.* per lb. on tanned leather? Speaking individually, I find no difference in the price of boots and shoes. Ask the shoemakers, and they will candidly tell you it has produced neither good to themselves nor the public. To whom then has the remission of the duty proved beneficial? I have a shrewd suspicion that the tanners, who are in general men of good pecuniary substance, coupled with some curriers of the higher class, are the persons who have kindly pocketed this foolish "god-send" of the Chancellor of the Exchequer.

ENORT.

Marlborough-terrace, Albany-road.

CONTINENTAL RAILWAYS.

The advantages of railroads have of late *years become so apparent*, that their con*struction has been* undertaken to a certain extent on the Continent. In France, a double line of railroad has been constructed, extending from St. Etienne to Lyons, a distance of 34 miles. This road is not adapted for very heavy transport, the rails weighing only 26 lbs. per yard. To obtain a sufficient level, 14 tunnels were constructed; one of these is a mile in length; another, more than half a mile, is carried under the river Gier. The road is carried by a viaduct over the Soane. In the cost of this road we have a notable example of the commercial wisdom of our neighbours, who paid for the iron used on it four times the price at which they could have obtained it from us! A part of this road is a self-acting plane, on which the loads are moved by their own weight; on the other parts of it locomotive-engines have been used.

A continuation of this road has been constructed from St. Etienne to Roanne, extending about 55 miles. It consists of a single track; the first 13 miles being formed of cast-iron rails of 43 lbs. to the yard, and the last 42 miles of rolled iron, 26 lbs. to the yard.

Among the enterprises of this kind undertaken in Germany, the railroad from Budweis to Lintz merits notice. The extent of this line is about 80 English miles; it was commenced under the direction of Gerstner in 1825, and is composed of wooden beams, bearing flat rails of iron, 6 yards in length, 2 inches in width, and one-third of an inch in thickness. It is intended for the purposes of general commerce, but more especially for the transport of salt.—*Edinburgh Review.*

RECENT AMERICAN PATENTS.

(Selected from the Franklin Journal for Sept. 1834.

SAFETY BOAT—*Geo. W. Eddy, New York.*—The improvement here patented consists in what the patentee calls *safety hulls*. In a steam-boat he proposes to build the main hull three hundred feet in length, and about eighteen or twenty inches in width. On each side of this main hull is to be a *safety hull*, which may be of the same width with it: they are to curve round the bow, so as to be of a good form for passing through the water, and the same at the stern. Spaces within them are to be left for the paddle-wheels, on each side of the main hull, or the wheels may be applied on the outside of the said safety hulls. "Said hulls, or trunks, may be made cylindrical, or partake of the section of a cylinder, or of any other shape." "Now what I claim as my invention, and for which I ask a patent, is the principle above described." This is not a very clear manner of claiming a new mode of construction

boats, and time will show to whom belongs what, we suppose, is intended by "the principle."

PAPER-CUTTING MACHINE—*John Ames, Springfield, Massachusetts.*—This apparatus is intended to cut machine paper into sheets of any required length, as it comes from the drying cylinders. The paper descends by its own gravity, and in doing so, passes the edge of a standing knife, which extends across the frame for the purpose of aiding in the cutting. Below the standing knife a shaft crosses the frame, carrying two disks, or arms, to which another knife, called the revolving knife, is attached. This, as it passes round, comes into contact with the standing knife, and between these the paper is divided, as by a pair of shears, the revolving knife being so placed, that it comes in contact with the standing knife at one end, whilst the other is at a distance of about three inches, thus cutting the paper successively along the whole width. As the paper is descending continuously, the sheet would be cut out of square, were not some provision made to prevent it: this is effected by means of a swing frame acted on by a cam, a bar across this frame coming in contact with the paper, and holding it at rest against the fixed knife during the moment of cutting, the cam then relieving it. The size of the sheet is regulated by that of the whirl on the shaft of the revolving knife, which can be changed at pleasure. The claim is not to "the revolving knife, nor any of the parts of the above described machine separately, but to the several parts in combination, as above described, for the purpose aforesaid."

ENDLESS STEAM SCREWS—*John Ingham and Julius Davis, New York.*—A hollow shaft is to revolve on gudgeons, and a part of this shaft is to be enlarged so as to form a globe or cylinder. From this globular part, arms are to project at right angles to the axis of the shaft, which arms are to have orifices at their sides, near to their extremities, from which steam, admitted into the shaft, is to issue, and, by its reaction, to cause the shaft to revolve. There may be four such arms, in two of which the orifices may be so made as to operate in a different direction from the other two, there being a suitable division in the globe or cylinder, to govern the steam in its course to either pair of arms. Steam may be admitted into either end of the shaft from an ordinary boiler; and, to increase the elasticity of this steam, it is proposed to admit a portion of the waste heat from the furnace into a case, or box, surrounding the globular body. Fire, if required, may also be made within this box, with the same view: this constitutes the steam part of the machinery. In order to use the power thus generated, there is to be an endless screw upon the shaft, which is to gear into a toothed wheel, from the shaft of which the desired communication may be made. This engine, we are told, may be used for propelling boats, for driving mills, for moving carriages upon railroads, raising vessels on marine railways, &c. &c. The claims are to the use and application of an endless screw in the manner, and for the purposes mentioned; the manner of using the globe, or cylinder, and exposing it to the escape heat of the boiler; and a valve or damper, by which the escape heat is directed upon, or diverted from, the globe; the method of changing the direction of the motion; and the "producing of a given degree of power by the use of steam, with less expense of fuel or machinery, and with less danger of explosion, than in any of the methods heretofore practised or known." Although this engine *may* be used for the various purposes designated, such an employment of it will not be the result of an intimate acquaintance with steam power, or that of mechanical arrangement. A less efficient way of using the former has rarely been proposed; and why this power should operate through the intervention of an endless screw, it would not be easy to tell, unless there is some hidden mystery in its action, with which we are unacquainted. A pinion or spur-wheel, upon the shaft, would prevent all that lateral thrust from the screw, to counteract the effect of which the patentees throw away a corresponding portion of their steam power, by making the orifices on the arms oblique, that the steam may issue in a direction which will counteract the thrust.

IMPROVEMENT IN THE CYLINDER PAPER MACHINE—*Joseph Truman, Pennsylvania.*—The patentee describes the construction of the ordinary cylinder machine for making paper, and then observes, that, from the manner in which the pulp is made to adhere to the revolving cylinder, there is a tendency in the fibres to arrange themselves in one direction, so as to give but little strength to the paper, which inconvenience it is the object of his invention to obviate. This he proposes to do by taking pieces of sheet copper, or other suitable material, and forming with them a sort of rack, by uniting them at one end to a cross bar, keeping them by this and other means, at a suitable distance from each other. These strips of metal are made concave at one edge, the curvature being adapted to that of the cylinder. This apparatus is to be placed within the vat, so that the concave edges will be nearly in contact with the cylinder, in consequence of

ıe pulp which passes to it must flow these plates. A vibratory motion is the cross bar, and consequently to ıs of metal attached to it; the sum distance through which the rack aterally, being equal to that of the of the cylinder in the same time. paratus thus becomes an agitator, s said that the paper is, by its means, equally strong in all directions. gitating the pulp, so as to completely : the fibres, equalise its consistence, equently strengthen the paper every te, I claim as my invention, though ified means and manner of doing it varied *ad libitum*." A person unac- l with the progress of invention in of paper-making, would be led to , from the specification of this pa- at the agitator for interlocking the f the pulp, was new in all its forms, he fact is, that although the evil ıed of existed to a very considerable ı the machine paper first made, it n so far obviated by the agitators ave been invented, as to leave but sible difference in the strength of paper in either direction.

NOTES AND NOTICES.

ford has left to the ministers of Lang- Westerkirk 1000*l.* sterling each, in trust raries of the above town and parish; the of which is to be annually expended in g books. This celebrated engineer was of Westerkirk.

ad in Egypt.—A Paris paper contains a n Alexandria, which states, that this rail- commence at Choubrah, will pass near and thence by the sides of Mokotam, to ation at Suez. Goods landed at Alexan- to be sent by steam-boats to Alfé by the Mack-Modie, and from thence to Chou- the Nile. From Choubrah they will be by waggons to Suez, whence they will on by steam to Bombay.

an Iron Steam-Boat.—Wednesday morn- 8th instant, arrived at our wharf, at five fter ten o'clock, Mr. G. B. Lamar's iron t John Randolph, from Savannah, which t ten o'clock on the morning of the 11th aving a tow-boat, one of the very largest n, very deeply laden, drawing upwards et more water than the steam-boat, and boat of the ordinary size, also deeply e traverse from Savannah to Augusta us been performed in 71½ hours, not- ing the detention on the upper part of from its low stage, which prevented the ning part of the night preceding her The dimensions of the boat are 110 feet 22 feet beam, and 7 feet 6 inches deep. m, and for 3 feet up her sides, is of the ish rolled iron of 5-16ths of an inch in and all above of the same description of an inch thick. Her engine and ma- eigh about 17 tons, and her single boiler ith her wood and water on board she 2 feet 6 inches. She was framed and er in the manufactory of William Laird and Son, at Liverpool, who also sent workmen out to refit her here. Her engine is a condens- ing one, of 36-horse power, with a 5 feet stroke, intended to work expansively under a pressure of 15 lbs. to the square inch. It is from the manu- factory of Fawcett, Preston and Co. of Liverpool. —*Augusta Herald, U. S.*

Iron Ships.—Eight iron ships have been sent out to India by the East India Company; four of them are tug-vessels, of 125 feet in length, with two engines of 30-horse power; and four are ac- commodation vessels, to be taken in tow by the tug-boats. They were built by Messrs. Mandslay and Co., and sent out in pieces to Bengal. When the first tug-boat was launched, it drew only 11 inches water before the engines were put on board; and with the engines on board, and a weight equivalent to its stores, it drew 1 foot 11 inches. The breadth of beam in this, as well as the next boat built was 23 feet; but in the remain- ing six vessels it was reduced to 20.

Thames Tunnel.—We are enabled to announce, that Government has consented to advance 250,000*l.* for the completion of the Thames Tunnel. The works will be immediately resumed, under the direct superintendence of Mr. Brunel.—*Globe.*

Mountain Suspension Bridge.—According to the French papers, it is in contemplation to join, by means of a suspension bridge, the summits of two mountains at several hundred feet distance, on the route from Annecy to Geneva. This bridge, which will be at an elevation of more than 250 feet from the torrent, will replace the old bridge which was destroyed by the Austrians in 1814, and effect a saving of nearly 3 miles.

The Drummond Light Improved.—A letter was read at the Royal Academy of Sciences, Paris, on the 18th of August last, from M. José Roura, pro- fessor of chemistry in the University of Barcelona, suggesting an improvement in the oxy hydrogen illumination of Captain Drummond, by substi- tuting the sulphate for the carbonate of lime. The former is powdered, mixed into a paste with some gum, and then cut into small pieces; the jet of oxygen and hydrogen upon it produces a most brilliant light—sulphurous acid and water are dis- engaged, and an oxide of calcium remains. M. Arago observed, that the French Light-House Com- mission were engaged in effecting a similar plan of illumination; after some experience, it was proved that the light emitted was equal to that of 20,000 Argand lamps; but this intensity is not constant, because the heat soon hardens the lime, so as to require frequent removal, or snuffing, to allow the flame to operate upon the fresh parti- cles. Another inconvenience is, that the light produced by a luminous body of such small di- mensions as a cylinder of lime, can have but a very slight divergence; and when upon the ho- rizon, its appearance at each point from a revolv- ing light would be almost instantaneous, so that navigators may fail in perceiving it, and be unable to discover the situation of the light-house.— *Athenæum.*

Large Lantern for a new Light-House at Cork. —One of the largest lanterns that was ever made has been shipped for the Cove of Cork, where a light-house has been erected on a new principle. The lantern is 36 feet over the top, and contains 9 lights, 6 red and 3 blue. It is made of plate- glass one-eighth of an inch thick. The height of the lantern is 11 feet. It was made by Mr. Deville of the Strand.—*True Sun.*

New Material for Cables.—A series of trials have lately been made at Paris, to ascertain the comparative strength of cables made of hemp and the aloe from Algiers. These trials all turned to of the advantage of the aloe. Of cables of equal

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A Rocket is only a light cannon, which, by the impulse of the lighted matter it contains, rebounds upwards in the direction of its breech, and this with the same velocity as that wherewith the combustible matter streams out at its mouth which looks downwards; this rebound is the rise of the rocket.—*M. de la Hire.*

French and English Fires.—"There is something imposing," says a London correspondent of a Paris paper, "in the spectacle of a fire in this metropolis. The English people, commonly so phlegmatic, so slow, so morbid, seem, in the twinkling of an eye, wholly to change character. What self possession, what order, under circumstances so painful and difficult! Accustomed as I have been to similar scenes in Paris, I could previously form no idea of the astonishing promptitude with which assistance the most efficacious was at once organised. I compared our wretched little engines, dragged with difficulty over the pavement of Paris, by our brave *pompiers*, already half dead with that fatigue, before the real occasion for their exertion begins. I compared those with the powerful pump engines brought to the spot by four powerful horses at full gallop, and the firemen sitting at their ease on the engines. I thought of the wild confusion of our chains—of the cries of all the workmen—of our leathern buckets brought empty to the engine, while I saw before me the water pouring, the streets inundated, and the pipes, like brilliant *jets d eau*, lit up by countless torches, and rising above the crowd as a symbol of safety to man in the midst of the dangers of fire. With us, every passer by is stopped to work the engine—here, the difficulty is to prevent the people from doing so."—*Le Temps.*

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Communications received from Mr. I ningham—Mr. Baddeley—Mr. Rutter—W. R.—H. C. C.

The publication of the Supplement Volume is, owing to an unavoidable de engraving of the Portrait of the late M deferred till the 1st of December.

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No. 588. SATURDAY, NOVEMBER 15, 1834. Price 3*d*.

BADDELEY'S FLOATING FIRE-ENGINE.

Fig. 1.

Fig. 2.

IMPROVED FLOATING FIRE-ENGINE.

"I gave directions to one of the firemen to bring up the floating engine, but being ebb tide it could not be brought up or got to work so promptly as, under other circumstances, it might have been."—*Mr. Braidwood's Letter to the Committee of the London Fire-engine Establishment, respecting the late fire at Westminster.*

Sir,—In constructing fire-engines for land service, their power is limited by several circumstances, but particularly by the difficulty and uncertainty of obtaining a sufficient quantity of water to supply the working of a large engine.

In the floating engines, however, this circumstance ceases to operate, and we find them generally constructed on a very large scale, and these powerful machines are of great service in extinguishing extensive conflagrations near the river. The usefulness of these engines is considerably abridged, however, by the difficulty in moving them from place to place, which is usually accomplished *by warping*; much valuable time is always occupied in getting them to a fire, and this can hardly be accomplished against tide. The inconvenience thus arising has often been most severely felt, as it was at the late tremendous conflagration at Westminster, where the prompt arrival of the floating engine would have been peculiarly advantageous, from the proximity of the worst of the fire to the water side. Could the aid of this powerful auxiliary have been obtained at an early period of the evening, there is no doubt the firemen would have succeeded much sooner in stopping the progress of the flames, thereby economising their own exertions, and saving much valuable property from destruction.

About seven years since, I was requested by the late Mr. Sam. Buston, then foreman to the London Assurance Corporation, to examine the floating engine belonging to that company, and to furnish a design for its improvement, especially providing for navigating it with greater facility than had previously been done. After duly considering the matter, I drew up an outline of several improvements which I conceived practicable, and submitted the plan to Mr. Buston, who highly approved of them; *before the thing was fully matured, however, Mr. Buston died*, and the Company having subsequently dispos their engine to the St. Katharine's Company, the mattter fell to the gr

Late occurrences have recalle circumstances to my mind, and I l lay the following particulars befor readers.

The floating engine alluded t erected in a strong boat, fifty feet by ten feet wide; it had three wo cylinders, seven inches in diameter, a twelve-inch stroke (the cylinde seen at *a*, *a*, *a*, in fig. 2, which ground plan of the engine with the posed improvement). The cylinde charged their water into a large vessel *b*; the pistons were worked three throw crank, put in motion l labour of forty or fifty men, appl the four revolving handles, *c*, *c*, each ten feet long. These handles connected with the central crank by able gearing.

The most striking and important ration I contemplated in this e consisted in adding a pair of p wheels, by means of which it cou propelled with considerable speed states of the tide. Fig. 1 is a v the engine thus equipped, and fig. hibits the mode of working the pa I proposed making the two for handles, *c*, *c*, capable of being det from the pumps, and connected wi paddles by a single sliding gearing are two spur-wheels on the axis revolving handles, working into a c wheel *f*, having a bevil wheel on its on the paddle shaft is a second wheel *g*, which is driven by the for

On turning the cranks, *c*, *c*, whic allow twenty-four men to work at a rapid motion is communicated paddle-wheels, sufficient to impe vessel through the water with con able velocity, in spite of any opp current.

This arrangement, if adopted, have enabled the floating engine to pete, in the rapidity of its move with its less powerful rivals on and would, there is no doubt, have rially altered the character of wate fires in general. Instead of waiting four, or five hours, for the arrival invaluable aid at a large fire, und

circumstances, an hour would
y ever have elapsed before it would
een in full play upon the devour-
ement.

ough an improvement of this na-
ould effect immense good, still it
be admitted, that the machine,
n that state, is not the *best* that
be employed. The *ne plus ultra*
-extinguishing machinery would
eam-floating fire-engine, of about
horse power.

boat, an iron one, should be built
rp as possible, and not to draw
ten or twelve inches water. The
of the steam-engine should be
e of being applied to the pumps
paddles at pleasure. To render
machine as efficacious as possible,
l fire should be continually burn-
as to keep the water at a tempe-
of about 100° or 150°.

boat should be run up and down
er occasionally—at least once a
-to ensure the perfect working of
eam apparatus. Under such a
, the steam might be got up and
ddles started in ten minutes after
ng an alarm of fire; provided the
e did not exceed two miles, ten
s more would be sufficient to
he engine to the scene of action;
e being previously attached, and
preparation made, five minutes
ould see the fire subjected to the
ng effects of two or more one-
lumns of water, poured in with a
ess that nothing could long with-

usefulness of these engines is not
d to the buildings immediately
ous to the river side; if furnished
ough leather hose, they will work
ffect at a distance of several hun-
eet; and the distance at which
ould furnish a supply of water to
ngines on land, is only limited by
gth of their pipes.

I remain, Sir,

Yours respectfully,

WM. BADDELEY.

, October 31, 1834.

PORTLAND BREAKWATER.

"Palmam qui meruit ferat."

Mr. Editor,—In order to satisfy you and the public that my late respected father, Mr. John Harvey, was the original and sole projector of this great national work—the very plausible case made out by Mr. Alex. Lamb, of London, in your Journal of the 31st inst., notwithstanding—I believe it will be only necessary to bring forward a very small portion of the documentary evidence which I am in possession of on the subject. Mr. Lamb's case is, that it was he who, in 1812, first conceived the plan, and suggested it to the late Mr. Idle, one of the representatives for Weymouth. The case which I propose to substantiate, on the part of my father, is, that it was designed and matured by him many years before 1812; that, in 1813, he communicated it to Mr. Abraham Bracebridge, of London (the same who is mentioned in Mr. Lamb's narrative), and that it was then submitted by Mr. Bracebridge to Mr. Idle, by whom Mr. Lamb was afterwards employed as Solicitor merely in the business.

The first document to which I have to beg attention, is the following letter from Mr. Bracebridge to my father:—

"No. 3, Bridge-court, Westminster,
Aug. 13, 1813.

"Dear Sir,—Although it is several months since I had the pleasure of a communication with you at Weymouth, the important improvement to which your conversation accidentally turned has never since been long together out of my thoughts, nor can I fear its having become less an object of your wish and ambition; because, though dismissed, perhaps, *for want of encouragement*, from your present intention (pending a more favourable period for such an enterprise), *I am confident a mind capable of forming such a design could never willingly abandon it*. You will perceive I allude to the practicability and usefulness of forming *a pier or breakwater in Portland Roads*, that would create a spacious national harbour, endowed with very peculiar advantages. As I understood you had in your possession *plans, soundings, and various requisite materials for this great work*, upon which such has been my reflection and contemplation, and consequent admiration of the plan, that I have ventured to mention it to some confidential, scientific, and other-

wise able friends; and from this investigation of the subject, its public and local benefits appear to increase and crowd upon the imagination. [Here follows a detailed enumeration of those benefits, which it is unnecessary to repeat, as they are all already familiar to the readers of the Mechanics' Magazine.] These, sir, were the feelings which led me to wish it may be in my power to render you any service in this matter, and induce you to turn your mind again to a plan *on which you have already bestowed so much trouble and attention.*

"I hope you will not deem my interference premature, or improper; but, on the contrary, see, as desirable, the aid that I can assure you would arise from many leading characters in London, who have expressed themselves favourable to the measure, so much so, as to urge my application to you, without delay, *that timely notice may be given to Parliament to obtain the necessary Act in the ensuing session.* My friends do not anticipate any difficulty in raising sufficient means, so that Weymouth and its vicinity would be at liberty to become subscribers to this great work, to an amount, much or little, as the safety or remuneration of the concern may appear on further development. I would wish to have your own sentiments in reply to this, before you make mention of it beyond the circle of your own confidential and particular friends, as it will be necessary for me to have *your approbation and authority* before I go farther in the way of communication with my connexions here; when, should you be disposed to make me useful *in putting this your great design in train*, it will be necessary for me to be so far favoured with your confidence, as to have much of the information you have possessed yourself of, that the practicability of the undertaking may be safely and fairly judged of:—such as the general plan, the distance, the depths of the water, nature of the foundation, length of the pier, set, rise, and power of the tide, and height of the waves at the intended pier, as near as may be, in most tempestuous weather; cost of the cut capstone in the island of Portland, and supposed expense of conveying it to the pier, with a plan, however rough, if possible, of the general design; accompanied with such other information and elucidation, as your able and zealous attention to this invaluable object has enabled you to afford.

"A mention of what ships and vessels this improvement, time back, might have saved, would be material.

"As soon as I can hear from you upon this subject, should your inclination, as I hope, continue favourable to take a lead in the business, I will say more to my friends here, and in particular to an able engineer, and prepare him to return with me, or wait upon you, that no time may be lost. I cannot but conclude that all your Members will give their best assistance; but I think I can answer for one, who is a gentleman so well skilled in such matters, and of great connexions, that I rest much upon him. I see, in the papers, preparations are making for opening the works at Cherbourg. What a time to offer to the public a similar undertakin! But I think you will agree with me in allowing one reason, above all others, for the undertaking at the present moment—the fear that, if the present spirit is suffered to expire, it may never be revived.

"I remain, &c.

"A. BRACEBRIDGE."

"To Mr. Harvey, sen.,
Weymouth."

Two important points are clearly established by this letter:—First, that it was *not*, as Mr. Lamb alleges, a "plan for converting Lulworth Cove into a harbour," which my father communicated to Mr. Bracebridge, but, as Mr. B. attests, a "*pier or breakwater in Portland Roads.*" Second, that it must have been *long before* Aug., 1813, that the plan of this "pier or breakwater" was broached by my father; for, in Aug., 1813, "several months" had elapsed since Mr. Bracebridge was verbally informed of it by my father; and my father had in his possession, at that early period, "plans, soundings, and various requisite materials for this great work;"—all which must have taken more time to prepare and collect, than would carry his conception much farther back than 1812, which is the earliest date to which Mr. Lamb professes to be able to carry back his "own suggestion."

The statement uniformly made by my father himself on the subject was, that he had conceived the plan as early as 1794; and nobody who is acquainted with the high character he possessed for uprightness and probity, will be inclined to suspect him of a design to deceive the public on this or any other subject. I believe I should have no difficulty in procuring scores of letters from persons to whom he communicated the plan between 1794 and 1812; but perhaps it may suffice that I give the following extract from a letter of his own, which he addressed on the subject to the late Sir

Cox Hippesley, Bart., dated Sept. 814:—

ou may, with the greatest truth, in- Lord Melville that the thought origi- with me *about twenty years ago*. I ntly named it to gentlemen without od effect, until I also mentioned it to . Bracebridge, of London, two or three ago; he contemplated the matter over own mind, and by his representation advantages to the navy and commerce, nd of his opinion Mr. IDLE, M.P., ther gentlemen."

th respect to the letter quoted by Lamb, which my father addressed r. Bracebridge, dated 30th Sept., there is nothing in that at all in- stent with the idea of his being the al author of the plan. It contains, true, no distinct affirmation of the but this is easily accounted for, by rcumstance that it was written in r to the letter before recited from racebridge, in which the latter had ised his claims to the honour of ating the scheme, in the fullest . Why reiterate what was not ted, but admitted on all hands?

hough, therefore, I can by no means to the pretensions which Mr. has now brought forward in re- to the matter, and cannot but sup- *that his memory has greatly deceived* to say the least), I am free to con- hat he has, by his exertions, brought er a great deal of most important ation on the subject. The docu- with which he has furnished you, hich you have given to the public ur 586th Number, are extremely ble, and can scarcely fail to be of use in facilitating the accomplish- of the great national object in ion.

ill avail myself of the opportunity fforded, to make a material obser- or two. The Shambles, off Port- which always shows itself either by or break, tends greatly to quell the f the channel sea, and is a *natural* water of vast extent and considera- as regards the entrance of the bay en Portland and St. Alban's-head. hambles might probably be consi- dangerous for large ships to and Portland Roads; but I beg to ob- that between the Bill of Portland he Shambles there is a fair working channel of from six to 10 fathoms depth —and if that is not considered sufficiently capacious in light or contrary winds, the ample space between the Shambles and St. Alban's-head (six leagues) affords abundant accommodation for ingress and egress into Portland Roads. In calms the anchor must, of course, be resorted to, as in all cases near land where the tide runs strong, till the return of a breeze; even small vessels seldom go to sea in a calm: neither would large ships, unless assisted by steamers, to embrace an opportunity of a channel tide. A large ship, with a breeze, bound from Portland Roads to the westward, with an ebb tide, would pass between the Race and Bill of Portland; and going to the eastward, with a flood tide, would leave the Shambles about three miles south-westerly, with an extent of sea-room (as before observed) between it and St. Alban's-head of six leagues.

I remain, Mr. Editor,

Respectfully, your obliged,

JOHN HARVEY.

Weymouth, Nov. 7, 1834.

THE RIGHT EMPLOYMENT OF WEALTH.

"A man of overgrown wealth may be allowed to spend it in any way he pleases, as the greatest injury he can do society is to hoard it." — *Mr. Loudon—Enc. of Cottage, Farm, and Villa Architecture.*

Sir,—The above text is the representative of certain crude notions which pervade a large class of well-meaning people, and it is therefore a fitting subject for analysis, in order to explode it if unsound, or to work it out if sound; for when a man like Mr. Loudon gives his sanction to an opinion it carries weight with it, and, when of importance, must do either much good or much harm. The case in question is the erection of Arundel Castle by the Duke of Norfolk, who thereby circulated his wealth.

The first position we have to settle is, what *is wealth?* The answer must be, all things physical and mental, which tend to the *weal*, *health*, or welfare of the holder of the wealth. Therefore, the actual use of the matters in question, on the part of the holder, must be taken into the account, or they cannot promote his *weal*. If a horse be the owner in ques-

size, that made of aloe raised a weight of 2,000 kilogrammes, that made of hemp a weight of only 400 kilogrammes.—*National.*

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Infant Schools and Female Influence.—At present the habits of too large a proportion of the work-people are very bad, and in order to save the rising generation from the effects of their bad examples, I know of no better plan than that of forming early and better impressions upon the infant mind. I have endeavoured to adopt such a course in our establishment, by the introduction of infant schools, under the care of young females of superior habits. I consider the females have the most powerful influence over the habits of young children; and for this reason, when I am selecting work-people, and am desirous of ascertaining their *characters, I pay more* regard to the character and habits of the mother than the father. Thi for instance, a young man applied to our ov to be employed, and stated that his fa worked for us. I recollected that two mer name had worked for us. I gave the ov permission to employ him, if he were th *one* of them; and not to give him permar ployment if he were the son of the *other.* determination I was guided solely by m ledge of the characters of the mothers. On was a country woman, a good housewife good moral habits, she had been a res farmer's daughter; the other was a slatter improvident, and always contriving to debt with the shopkeepers. I should invaria fer a family where the character of the mo good, but the father indifferent, to a family w character of the mother was indifferent, an the father good. We have not, however, pursue detailed inquiries into the characte who are employed, and we are, therefore, to act on such results of experience as th have mentioned, respecting the influenc mothers. From what I have seen of th operation of that influence, I consider th schools are a most important step to the i ment of our manufacturing population, wh are under the control of females, they are be lified to convey correct feelings to the infa than men are, for children of the same age. infant school, we are sure they learn to be and orderly, and to restrain their passions sure that, in a large proportion of cases, it at their own houses. The workmen, even rude and uneducated among them, who make very nice distinctions, always prefe who has been educated at an infant s those children are the most obedient an Such children are bespoken beforehand workmen who engage their own piecers the most pointed way in which the effects schools have been already manifested.—*before Factory Commissioners.*

A Nobleman his own Architect.—Arun was for many years the scene of the late Norfolk's trials at building; by which, a architect, he sought to instruct himself i thic style. After being occupied in this upwards of forty years, expending severa thousand pounds, he just arrived at la point where a man discovers his own ut rance. We make no reflection on the m the noble duke on this account—we me the fact. A man of overgrown wealth r lowed to spend it in any way he pleas greatest injury he can do society is to Had the duke employed an architect, he doubt, have possessed a castle in a very taste, both externally and internally, Arundel castle now is; but it does not f he would have been so happy in seeing perfect works of his architect, as he was i the crude ideas of his own mind.—*Mr. Enc. of Cottage Front and Ville Architec*

Communications received from Mr. H ningham—Mr. Baddeley—Mr. Rutter—' W. R.—H. C. C.

The publication of the Supplement t Volume is, owing to an unavoidable de engraving of the Portrait of the late M deferred till the 1st of December.

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Fig. 1.

Fig. 2.

IMPROVED FLOATING FIRE-ENGINE.

"I gave directions to one of the firemen to bring up the floating engine, but being ebb tide it could not be brought up or got to work so promptly as, under other circumstances, it might have been."—*Mr. Braidwood's Letter to the Committee of the London Fire engine Establishment, respecting the late fire at Westminster.*

Sir,—In constructing fire-engines for land service, their power is limited by several circumstances, but particularly by the difficulty and uncertainty of obtaining a sufficient quantity of water to supply the working of a large engine.

In the floating engines, however, this circumstance ceases to operate, and we find them generally constructed on a very large scale, and these powerful machines are of great service in extinguishing extensive conflagrations near the river. The usefulness of these engines is considerably abridged, however, by the difficulty in moving them from place to place, which is usually accomplished *by warping;* much valuable time is always occupied in getting them to a fire, and this can hardly be accomplished against tide. The inconvenience thus arising has often been most severely felt, as it was at the late tremendous conflagration at Westminster, where the prompt arrival of the floating engine would have been peculiarly advantageous, from the proximity of the worst of the fire to the water side. Could the aid of this powerful auxiliary have been obtained at an early period of the evening, there is no doubt the firemen would have succeeded much sooner in stopping the progress of the flames, thereby economising their own exertions, and saving much valuable property from destruction.

About seven years since, I was requested by the late Mr. Sam. Buston, then foreman to the London Assurance Corporation, to examine the floating engine belonging to that company, and to furnish a design for its improvement, especially providing for navigating it with greater facility than had previously been done. After duly considering the matter, I drew up an outline of several improvements which I conceived practicable, and submitted the plan to Mr. Buston, who highly approved of them; *before the thing* was fully matured, *however, Mr. Buston* died, and the Company having subsequently disp their engine to the St. Katharine Company, the mattter fell to the

Late occurrences have recall circumstances to my mind, and I lay the following particulars bef readers.

The floating engine alluded erected in a strong boat, fifty fe by ten feet wide; it had three cylinders, seven inches in diamet a twelve-inch stroke (the cylind seen at *a*, *a*, *a*, in fig. 2, whic ground plan of the engine with t posed improvement). The cylind charged their water into a lar vessel *b*; the pistons were worke three throw crank, put in motion labour of forty or fifty men, ap the four revolving handles, *c*, each ten feet long. These handl connected with the central crank able gearing.

The most striking and importa ration I contemplated in this consisted in adding a pair of wheels, by means of which it c propelled with considerable spee states of the tide. Fig. 1 is a the engine thus equipped, and fig hibits the mode of working the I proposed making the two handles, *c*, *c*, capable of being d from the pumps, and connected paddles by a single sliding gearin are two spur-wheels on the axis revolving handles, working into a wheel *f*, having a bevil wheel on on the paddle shaft is a secon wheel *g*, which is driven by the f

On turning the cranks, *c*, *c*, wh allow twenty-four men to work a a rapid motion is communicated paddle-wheels, sufficient to im vessel through the water with c able velocity, in spite of any o current.

This arrangement, if adopted, have enabled the floating engine pete, in the rapidity of its mov with its less powerful rivals on and would, there is no doubt, hav rially altered the character of wa fires in general. Instead of waitin four, or five hours, for the arrival invaluable aid at a large fire, u

circumstances, an hour would
y ever have elapsed before it would
een in full play upon the devour-
ment.

ough an improvement of this na-
ould effect immense good, still it
be admitted, that the machine,
n that state, is not the *best* that
be employed. The *ne plus ultra*
-extinguishing machinery would
eam-floating fire-engine, of about
horse power.

boat, an iron one, should be built
rp as possible, and not to draw
ten or twelve inches water. The
of the steam-engine should be
e of being applied to the pumps
paddles at pleasure. To render
machine as efficacious as possible,
l fire should be continually burn-
as to keep the water at a tempe-
of about 100° or 150°.

boat should be run up and down
er occasionally—at least once a
-to ensure the perfect working of
am apparatus. Under such a
, the steam might be got up and
idles started in ten minutes after
ng an alarm of fire; provided the
e did not exceed two miles, ten
s more would be sufficient to
he engine to the scene of action;
e being previously attached, and
preparation made, five minutes
ould see the fire subjected to the
ng effects of two or more one-
lumns of water, poured in with a
ss that nothing could long with-

usefulness of these engines is not
d to the buildings immediately
ous to the river side; if furnished
ough leather hose, they will work
ffect at a distance of several hun-
et; and the distance at which
ould furnish a supply of water to
ngines on land, is only limited by
gth of their pipes.

I remain, Sir,

Yours respectfully,

WM. BADDELEY.

, October 31, 1834.

PORTLAND BREAKWATER.

"Palmam qui meruit ferat."

Mr. Editor,—In order to satisfy you and the public that my late respected father, Mr. John Harvey, was the original and sole projector of this great national work—the very plausible case made out by Mr. Alex. Lamb, of London, in your Journal of the 31st inst., notwithstanding—I believe it will be only necessary to bring forward a very small portion of the documentary evidence which I am in possession of on the subject. Mr. Lamb's case is, that it was he who, in 1812, first conceived the plan, and suggested it to the late Mr. Idle, one of the representatives for Weymouth. The case which I propose to substantiate, on the part of my father, is, that it was designed and matured by him many years before 1812; that, in 1813, he communicated it to Mr. Abraham Bracebridge, of London (the same who is mentioned in Mr. Lamb's narrative), and that it was then submitted by Mr. Bracebridge to Mr. Idle, by whom Mr. Lamb was afterwards employed as Solicitor merely in the business.

The first document to which I have to beg attention, is the following letter from Mr. Bracebridge to my father:—

"No. 3, Bridge-court, Westminster,
Aug. 13, 1813.

"Dear Sir,—Although it is several months since I had the pleasure of a communication with you at Weymouth, the important improvement to which your conversation accidentally turned has never since been long together out of my thoughts, nor can I fear its having become less an object of your wish and ambition; because, though dismissed, perhaps, *for want of encouragement*, from your present intention (pending a more favourable period for such an enterprise), *I am confident a mind capable of forming such a design could never willingly abandon it*. You will perceive I allude to the practicability and usefulness of forming *a pier or breakwater in Portland Roads*, that would create a spacious national harbour, endowed with very peculiar advantages. As I understood you had in your possession *plans, soundings, and various requisite materials for this great work*, upon which such has been my reflection and contemplation, and consequent admiration of the plan, that I have ventured to mention it to some confidential, scientific, and other-

wise able friends; and from this investigation of the subject, its public and local benefits appear to increase and crowd upon the imagination. [Here follows a detailed enumeration of those benefits, which it is unnecessary to repeat, as they are all already familiar to the readers of the Mechanics' Magazine.] These, sir, were the feelings which led me to wish it may be in my power to render you any service in this matter, and induce you to turn your mind again to a plan *on which you have already bestowed so much trouble and attention.*

"I hope you will not deem my interference premature, or improper; but, on the contrary, see, as desirable, the aid that I can assure you would arise from many leading characters in London, who have expressed themselves favourable to the measure, so much so, as to urge my application to you, without delay, *that timely notice may be given to Parliament to obtain the necessary Act in the ensuing session.* My friends do not anticipate any difficulty in raising sufficient means, so that Weymouth and its vicinity would be at liberty to become subscribers to this great work, to an amount, much or little, as the safety or remuneration of the concern may appear on further development. I would wish to have your own sentiments in reply to this, before you make mention of it beyond the circle of your own confidential and particular friends, as it will be necessary for me to have *your approbation and authority* before I go farther in the way of communication with my connexions here; when, should you be disposed to make me useful *in putting this your great design in train*, it will be necessary for me to be so far favoured with your confidence, as to have much of the information you have possessed yourself of, that the practicability of the undertaking may be safely and fairly judged of:—such as the general plan, the distance, the depths of the water, nature of the foundation, length of the pier, set, rise, and power of the tide, and height of the waves at the intended pier, as near as may be, in most tempestuous weather; cost of the cut capstone in the island of Portland, and supposed expense of conveying it to the pier, with a plan, however rough, if possible, of the general design; accompanied with such other information and elucidation, as your able and zealous attention to this invaluable object has enabled you to afford.

"A mention of what ships and vessels this improvement, time back, might have saved, would be material.

"As soon as I can hear from you upon this subject, should your inclination, as I hope, continue favourable to take a lead in the business, I will say more to my friends here, and in particular to an able engineer, and prepare him to return with me, or wait upon you, that no time may be lost. I cannot but conclude that all your Members will give their best assistance; but I think I can answer for one, who is a gentleman so well skilled in such matters, and of great connexions, that I rest much upon him. I see, in the papers, preparations are making for opening the works at Cherbourg. What a time to offer to the public a similar undertakin! But I think you will agree with me in allowing one reason, above all others, for the undertaking at the present moment—the fear that, if the present spirit is suffered to expire, it may never be revived.

"I remain, &c.

"A. BRACEBRIDGE."

"To Mr. Harvey, sen.,
Weymouth."

Two important points are clearly established by this letter:—First, that it was *not*, as Mr. Lamb alleges, a "plan for converting Lulworth Cove into a harbour," which my father communicated to Mr. Bracebridge, but, as Mr. B. attests, a "*pier or breakwater in Portland Roads.*" Second, that it must have been *long before* Aug., 1813, that the plan of this "pier or breakwater" was broached by my father; for, in Aug., 1813, "several months" had elapsed since Mr. Bracebridge was verbally informed of it by my father; and my father had in his possession, at that early period, "plans, soundings, and various requisite materials for this great work;"—all which must have taken more time to prepare and collect, than would carry his conception much farther back than 1812, which is the earliest date to which Mr. Lamb professes to be able to carry back his "own suggestion."

The statement uniformly made by my father himself on the subject was, that he had conceived the plan as early as 1794; and nobody who is acquainted with the high character he possessed for uprightness and probity, will be inclined to suspect him of a design to deceive the public on this or any other subject. I believe I should have no difficulty in procuring scores of letters from persons to whom he communicated the plan between 1794 and 1812; but perhaps it may suffice that I give the following extract from a letter of his own, which he addressed on the subject to the late Sir

Cox Hippesley, Bart., dated Sept. 814:—

You may, with the greatest truth, in- Lord Melville that the thought origi- with me *about twenty years ago*. I ently named it to gentlemen without ood effect, until I also mentioned it to A. Bracebridge, of London, two or three ago; he contemplated the matter over own mind, and by his representation advantages to the navy and commerce, nd of his opinion Mr. IDLE, M.P., ther gentlemen."

ith respect to the letter quoted by Lamb, which my father addressed Ir. Bracebridge, dated 30th Sept., , there is nothing in that at all in- stent with the idea of his being the nal author of the plan. It contains, true, no distinct affirmation of the but this is easily accounted for, by ircumstance that it was written in er to the letter before recited from Bracebridge, in which the latter had mised his claims to the honour of nating the scheme, in the fullest nt. Why reiterate what was not ited, but admitted on all hands?

though, therefore, I can by no means t to the pretensions which Mr. b has now brought forward in re- to the matter, and cannot but sup- *that his memory has greatly deceived* to say the least), I am free to con- hat he has, by his exertions, brought her a great deal of most important mation on the subject. The docu- s with which he has furnished you, which you have given to the public our 586th Number, are extremely able, and can scarcely fail to be of l use in facilitating the accomplish- of the great national object in ion.

vill avail myself of the opportunity afforded, to make a material obser- n or two. The Shambles, off Port- which always shows itself either by e or break, tends greatly to quell the of the channel sea, and is a *natural* water of vast extent and considera- as regards the entrance of the bay een Portland and St. Alban's-head. Shambles might probably be consi- l dangerous for large ships to and Portland Roads; but I beg to ob- , that between the Bill of Portland the Shambles *there is a fair working* channel of from six to 10 fathoms depth —and if that is not considered sufficiently capacious in light or contrary winds, the ample space between the Shambles and St. Alban's-head (six leagues) affords abundant accommodation for ingress and egress into Portland Roads. In calms the anchor must, of course, be resorted to, as in all cases near land where the tide runs strong, till the return of a breeze; even small vessels seldom go to sea in a calm: neither would large ships, unless assisted by steamers, to embrace an opportunity of a channel tide. A large ship, with a breeze, bound from Portland Roads to the westward, with an ebb tide, would pass between the Race and Bill of Portland; and going to the eastward, with a flood tide, would leave the Shambles about three miles south-westerly, with an extent of sea-room (as before observed) between it and St. Alban's-head of six leagues.

I remain, Mr. Editor,
Respectfully, your obliged,
JOHN HARVEY.

Weymouth, Nov. 7, 1834.

THE RIGHT EMPLOYMENT OF WEALTH.

"A man of overgrown wealth may be allowed to spend it in any way he pleases, as the greatest injury he can do society is to hoard it." — *Mr. Loudon—Enc. of Cottage, Farm, and Villa Architecture.*

Sir,—The above text is the representative of certain crude notions which pervade a large class of well-meaning people, and it is therefore a fitting subject for analysis, in order to explode it if unsound, or to work it out if sound; for when a man like Mr. Loudon gives his sanction to an opinion it carries weight with it, and, when of importance, must do either much good or much harm. The case in question is the erection of Arundel Castle by the Duke of Norfolk, who thereby circulated his wealth.

The first position we have to settle is, what *is wealth?* The answer must be, all things physical and mental, which tend to the *weal, health*, or welfare of the holder of the wealth. Therefore, the actual use of the matters in question, on the part of the holder, must be taken into the account, or they cannot promote his weal. If a horse be the owner in ques-

tion, his *wealth* must consist in pasture and water, hay, corn, and straw, with occasionally a warm stable, and abundance of pleasant space for exercise. If he have *enough* of all these things, his *weal* would be in no way increased by doubling them, unless, indeed, a companion or companions were placed with him, thereby to increase his comfort by the exercise of his social qualities. To secure the comfort of the horse and his companions, it is therefore necessary that their joint *wealth* be equal to the wants of all. To give them more than that amount, would be as superfluous as to gild their oats, or build them marble palaces. Horses are not provided with forethought, consequently being devoid of anxiety, they have no tendency to *hoard*. But human beings, provided with forethought, have anxiety; and though they may have enough *wealth* for the *weal* of to-day, they are not at ease unless they can store up for to-morrow, and many more days; in short, unless they can store up many fold the amount which they can use, to guard against the possibility of destitution. Amongst the most savage of the human race, forethought is the least active; some of them are contented with the coarse, spontaneous productions of the earth, gathering them as they want them; others store them up in small quantities. In civilised life, the greatest hoarders are those of weak minds, who, possessing abundance of forethought, yet lack the judgment to calculate circumstances truly. Consequently they work constantly and hardly, and consume sparingly. The results of their labours are mostly consumed by others. In uncivilised life, almost the only *wealth* which human beings can use consists of provisions, and as these provisions, for the most part, only last through the year, the amount which is worth hoarding is very limited. In civilised life, on the contrary, there is a representative of provisions—viz. money—and therefore the power of hoarding is unlimited, *i. e.* people can grow a great quantity of provisions, or make works of art, and sell the surplus for money. But the value of the money can only consist in its applicability to exchange for provisions, or works of art, at a future time. *A man has grown a quarter of corn more than he can eat in the year.* He therefore gives it to another man, for an acknowledgment either in metallic or paper money; which acknowledgment means, that he will have his quarter of corn returned to him at a future time. Now it must be quite clear, that the money itself is not actual *wealth*, but only the representative of prospective wealth. If the wealth itself—the quarter of corn—were not produced in the following year, or any succeeding year, the money could be of no value; it could not conduce to the holder's *weal* by the purchase of corn. Supposing the word corn to represent provisions generally, the man might be starved to death in spite of his money. As for other objects of value, such as works of art, they can only be of a secondary value. Food is the base, and art the superstructure, of human enjoyment. Take away the food, and nothing can have any value, so far as living beings are concerned.

Now, when Mr. Loudon talks of "a man of overgrown wealth hoarding it," he must mean by *wealth* money, *i. e.* the representative of wealth; for, of course, he cannot mean that any landholder, or householder, hoards up houses, or land, or corn, or cattle, or, in short, either provisions or other articles of utility. That a landholder or householder may like to increase his capital to an unlimited amount, is perfectly probable, because he may be induced by two motives—the weakness which cannot see the extent of capital necessary to guard against the possibility of privation—or the extreme love of the power which money confers, which power he may use either tyrannically or benevolently, according to the tendency of his nature. Now it happens, that money itself is just as much an article of commerce as the things it represents. It is lent out at interest, in which way it is made productive, just as seed is when put in the earth. Mr. Loudon will not assert that people of capital make a practice of hoarding their money, except perhaps some few eccentric, half-witted beings. When a landholder of large means receives his rents he does not put them in a chest, he either buys property with them, or lends them at interest. But those to whom he lends them cannot pay the interest, unless they employ the money in some profitable business,

child lends money at interest; while Grosvenor, who bears the reputa- f a hoarder, builds houses, and gets er interest in the shape of rents. rd Grosvenor were to build houses, ten not suffer them to be occupied, re he to buy land, and then not it to be cultivated, he would be a hoarder; and if he were to carry n to an extent mischievous to the weal, the nation at large would tified in treating him as a lunatic, lacing his property in hands bet- lculated to make it fructify. But were to receive his rents annually, annually hoard them, and thus ally become the possessor of all the lic coin in England, I do not see he "hoarding would do injury to y," except by the example of the or foolish spirit in which it might ctised. If the precious metals were y to disappear by such a process, he bank-notes were to accompany ploughing and sowing, and buy- nd selling, and chair and table g, would assuredly go on notwith- ng, and some new circulating me- would be provided to facilitate erce.

the case of Arundel Castle, a posi- lischief was done. A large quan- good material was wasted, and a quantity of men's time misem- l. No utility was the result, ex- he amusement of a foolish aristo-

If it be alleged, that a large num- f workmen were maintained in yment by him, the answer is, that had better have been maintained eness, than have been employed to material, and pervert other people's

If the necessity of keeping up of industry be used as an argu- then the answer is, that the sim- ocess of digging holes, and filling up again, would have answered purpose.

e public mind is at present in a xcited state on the subject of rail-

Some of these railroads are, it is highly useful and economical, but are only economical in virtue of being useful. Take away their nd they become a positive waste. of the railroads now planning and ting by quacks and jobbers are in *recise condition,* and therefore the morbid excitement of the public mind requires allaying by the process of reasoning. Shares have been bought and sold in South-American mines which have never existed, and in many cases of actual existence the mines were about as valuable for all purposes of profit as though they had been located in the moon. Now, it is quite clear, that a railroad of no use, which is executed in England, is, in a national point of view, rather more wasteful than a gambling in shares of a suppositious mine; because, in the former case, material is wasted as well as time, in the latter time only. "Ah!" exclaims the anti-hoarders, "but only think of the employment given to labourers — without the railroad they would have had no work!" Not so, good anti-hoarders! The men must be fed somehow or other, whether they work or not; and if they do work, the best work is that which is most useful; the next best, that which is least mischievous. It is far better to dig holes and fill them up again, than to waste material in the construction of useless railroads.

Should Mr. Loudon disagree with me in this view of the matter, I shall feel obliged to him to state "how otherwise," as the Chancery bills have it.

I remain, Sir,

Very truly yours,

JUNIUS REDIVIVUS.

November 10, 1834.

SAILING IN THE WIND'S EYE.

Sir,—In the latter part of your last volume of the Mech. Mag., I perceive that mention is again made of "sail-worked paddles," in the shape of a re-invention, by a person who perhaps is ignorant that it was ever thought of or tried before, as a patent for it appears to be in contemplation.

As a person who has wasted many thoughts upon the possibility of a vessel's effecting a *direct* course in the wind's eye, I venture to suggest a remark or two upon the subject, with a friendly view towards the Irish re-inventor, who may thereby be induced to pause, or witness the actual working of

his model against a head wind, before he incurs the expenses of a patent.

In one sense a horizontal windmill is admirably adapted for the purpose in question, because the course of the vessel can be changed to any direction of the wind with the greatest facility; but this appears to me to be its only recommendable feature: for the vessel has, on the other hand, to sustain the weight of four or more sails with spars, in order to obtain the actual benefit of one in succession, to give her the required propulsion. Again, although a person enamoured of the scheme might flatter himself, that the resistance of the returning sails (however well feathered) would be trifling, still, on a closer investigation, it will be evident that they oppose a serious resistance in their encounter with the teeth of old Boreas. For, supposing a trial of "head-wind sailing" to be made in a gale of wind, it is clear that the returning sails would not only have to encounter the force of the velocity of the wind, to which may be added the vessel's way, if she made any, but also the resistance created by the mill's velocity

Fig. 1.

—the sum of which resistances would amount to more than that caused by a hurricane.

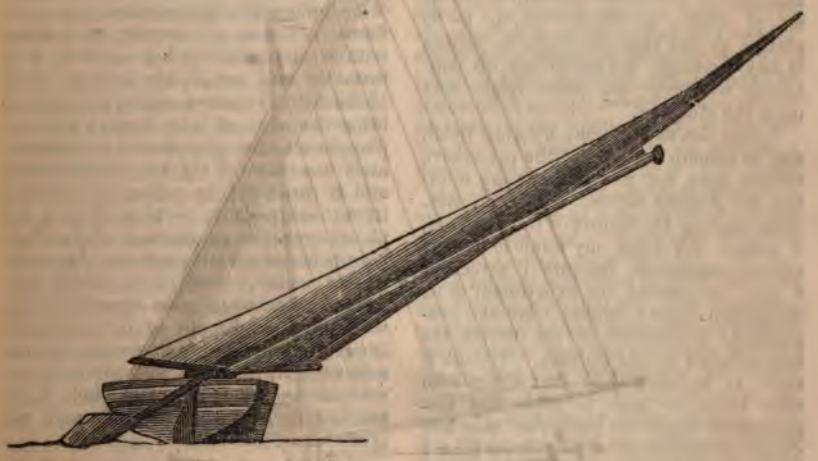
Now, as it is practically known to seamen, *how laborious* it is to pull even a *good rowing boat* to windward, in a strong breeze, with her masts stepped, or, in other words, with the application of an internal force, what can be hoped from an external one, which, to a certain extent, is endeavouring to drive the vessel astern—without, in fact, any pos-

sibility of forcing a passage in the wind's eye, but by causing the paddle-wheel to revolve much slower than the mill, and thereby gaining the requisite leverage by which to overcome all the resistances?

Pondering upon all the above difficulties, I imagined it possible to effect something by going another way to work, which was that one *large sail* only should be employed to create the propulsive stroke. Having tried an experiment upon a model boat, I venture, although I cannot boast of success, to enclose you a sketch of it, which you are at liberty to give to the public, if you agree with me in the opinion, that even the publication of unsuccessful experiments, when made with industry and care, may further the ends of science—whether as a landmark to warn others not to waste their time in similar pursuits, or as an approximation to something better from more able or fortunate imaginations. And in making this communication, I hope that the amateurs of *mill-sailing* may be induced, through the medium of your valuable publication, to state what has already been effected by horizontal mills, of whatever shape or number of sails—whether gigot, or leg-of-mutton, latine parallelograms, or squares, no matter which—how nigh the wind they actually moved without stopping short—in short, any thing but panegyrics upon an untried and indeterminate quality.

Without being at all in love with my own idea, but rather in despair of obtaining any good fruit, by whatever pains I might bestow upon it, I made a boat with its sail (as shown in fig. 1.), which I shall attempt to describe, so as to explain the action. The mast *a* is hung upon pivots B B; a weight, somewhat heavier than that of the mast and sail, is fixed to its lowest extremity, and the mast is permitted to swing from side to side to the angle shown in fig. 2. The rod, or spar C C, *is firmly* fixed to the *mast, so as to partake of its* motion; to the aftermost extremity of the rod is affixed the paddle-shaft *f*; to which is hung, upon joints or hinges, the paddle *g*, which is allowed alternately to make an angle of 45° with the vessel's keel, its power being directed partly to turn the vessel, and partly to force her a-head, similar to what takes place in sculling. It will be seen in fig. 2, that the paddle, or scull-shaft, is always in the same direction as the vessel's mast;

Fig. 2.



and what I had hoped to obtain by the contrivance was, a quick succession of very short "tacks;" and thus making, if not a mathematical straight course to windward, at least one which would answer all the practical purposes of one, as shown by the serpentine line *a b*. Admitting a vessel to proceed up a canal with the wind directly down it, the action would be as follows:—In the boat shown in fig. 2 suppose the wind to be upon her starboard-bow, it would shift the sail to the same angle on the larboard side; in doing which, imagine a stroke given to the paddle of sufficient power to force her "a-head," and also to change her direction until the wind was brought upon her larboard-bow, when the sail would again be shifted on the starboard side, then on the other, and the alternate strokes maintained in quick succession. Should the vessel's course be changed, with respect to the direction of the wind, the sail might be set at liberty to revolve, so as to be placed at any required angle for sailing in any direction, always giving up *mill-sailing* whenever the vessel made way upon the old plan.

I tried the experiment, blowing fresh, and in smooth water, but the propulsive strokes were not powerful enough to effect the desired object. However, notwithstanding the failure of the first trial, I cannot yet bring my mind to believe success impossible, because I perceived I had not carried the experiment to its maximum effect; neither were the proportional dimensions of the model the best adapted for the purpose. I think it right to mention this, that others who may hereafter wish to make any improvement upon the principle, may not depair altogether of better success than I have obtained.

Should I ever be induced to make a second experiment, which I should not attempt without making the model of a vessel expressly for the purpose, I will not fail to give you the result; and in the mean time, I hope to see in the valuable pages of your excellent Magazine, some account of experiments in *mill-sailing*.

I am, Sir,

Your obedient servant,

Θ.

Oct. 15, 1834.

ON FLAME.

Sir,—I have observed, in the recent Numbers of your Magazine, a succession of papers on flame. The authors of those articles have, like the compilers of our elementary works on chemistry, referred only to Mr. Sim's elegant experiments upon the subject, being, apparently, unaware that Mr. John Davies, chemical lecturer, of Manchester, has given, in the Annals of Philosophy, vol. viii., a more striking illustration, in a paper characterised by Dr. Thomson, in his Treatise on Heat, as "very interesting."

Mr. Davies's experiments are simple and conclusive. He places a fragment of phosphorus, or other inflammable body, in the flame, either of a candle or of spirit of wine. The combustible is not lighted in either case. In the flame of spirit of wine especially, the experiment admits of various modifications. When phosphorus is introduced into the flame, it burns, on coming in contact with it; but when it has entered, it is instantly and completely extinguished. If the flame be blown obliquely, so as to bring the edge of it in contact with the phosphorus, the phosphorus is immediately in a state of vigorous combustion; and if the flame be suffered to resume its vertical position, so as to inclose the phosphorus, the combustion of the phosphorus is again extinguished. An experiment which, while it is easily performed upon a watch glass or small Wedgwood dish, is directly at variance with Sir Humphrey Davy's statements on the subject. If, when the phosphorus is enveloped by the flame of alcohol, it be touched by a red-hot wire, it will not ignite, or be materially affected.

Mr. D. has, in his paper, applied his experiments to explain a variety of phenomena connected with the subject of flame.

I may add, and it ought to be recollected, that the first experiment on this subject was made by Dr. Franklin. He held, steadily, a match across the flame of a candle, and he observed that those parts of the match were most burned which were exposed to the edge of the flame. He therefore concluded, very justly, that there is no combustion going on inside of an ordinary flame. This

experiment seems to have escaped the notice of Sir Humphrey Davy. Franklin's experiment may be more decisively performed with a larger flame, as that of spirit of wine, or of pyroxylic spirit.

It would, I am sure, be interesting to your readers to see, in a small compass, an account of the Doctor's sagacious anticipations of a number of modern discoveries illustrated, as those anticipations were, by the most simple and homely contrivances. The encouraging example of this great man, which cannot be too often or too much held up to imitation, shows that very extraordinary results may be attained by very ordinary resources, and under very inauspicious circumstances.

I am, Sir, yours, &c.,
A CONSTANT READER.

THE PENNY CYCLOPÆDIA.

In the Mechanics' Magazine for March 23, 1833, we gave a review of the first three months' Numbers of the Penny Cyclopædia; since then we have observed its progress, with the intention of making a report to our readers on its completing its first stage, or arriving at the end of letter A; and this we now first have an opportunity of doing in the month of November, of the year 1834. The Penny Cyclopædians have, for a year last past, been in the habit of giving the lie to the title of their periodical, by publishing two numbers a week, thereby extracting, not a penny but twopence, from the pockets of their purchasers; and yet, with all this extra speed, it has taken no less than one year, two months, and a week, to reach the end of the first letter of the alphabet, which, as most of our readers are probably aware, consists of twenty-six. This one letter, thus delivered by the twopenny instead of the penny post, occupies about two volumes and a third of a work, which is intended to find a place, somehow or other, in every cottage in the kingdom: a work which, if carried on as it has been begun, will merely amount to just sixty volumes folio (and a fraction), and take just forty years in completing, that is to say, forty years at the increased rate of publication *now adopted!* *All this* calculation is easy enough to make; and yet the Society for the Diffusion of Useful Knowledge seem never to have made it. They stated, at the commencement of their labours, that they had ascertained, *with as much accuracy as possible*, the size to which the Cyclopædia would extend: and what, gentle reader, think you is the number of volumes to which these gentlemen's anticipations pointed —to which they almost pledged themselves, if not quite?—Why, truly, neither more nor less than EIGHT!! A Cyclopædia in eight volumes, with the letter A occupying two and a third!

It may, however, be said that there is an evident inapplicability in this calculation—that so much greater a quantity of names and words fall under the letter A than under some other letters, that it must necessarily occupy a larger space. This is certainly the fact, and an allowance must be made accordingly; but much less in the case of the Penny Cyclopædia than in most others. Its principle is never to give any science entire, but distributed under its separate heads. Thus Anatomy, which might be expected to occupy some dozen columns, at least, of the 2,566 devoted to the letter A, is "knocked off" in almost a dozen lines; and under the head "Architecture," the reader is referred to about a quarter of a hundred of articles yet to come on "Egyptian, Grecian, Roman, Italian, English," &c. &c. &c. It is besides admitted in the Preface to the first volume, that the work was commenced and at first conducted on a much smaller scale than has now been thought proper, and that expectations are entertained of still further improvement—in bulk, we suppose, as well as matter. On the whole, we have no hesitation in pronouncing, from an inspection of several other Cyclopædias, the Britannica, the Metropolitana, &c., that the work, if completed on its present scale, must occupy somewhere about forty volumes; and will therefore be completed somewhere about the year 1863! Such is the gigantic present which the Society for the Diffusion of Useful Knowledge purpose offering to the mechanics and cottagers of this and the next generation! The young men who have begun taking it in the letter A, will be old men before they arrive at the letter Z.

Having said thus much on the extent of the work, we must add, that it is nevertheless our hope, that the Society, having gone so far, will not, at this stage of the business, set about retracing their steps, and reverting to their original plan of eight volumes, or any thing like it. A well-proportioned work, even though the size may be somewhat exorbitant, is much preferable to an ill-shaped monster, with its head too big for its body, and its body too big for its legs—such as some late Histories of Natural Philosophy, Spain and Portugal, &c., in a similar collection, which we need not name. The Penny Cyclopædia, in forty volumes folio, will not be what the Penny Cyclopædia was to be—a work of a new character, adapted for the vast new class of readers now pouring into the bookish world—but it may be made a very useful addition to the Cyclopædias already in the market. We hope the Society will continue it on its present scale, but see the propriety of publishing it a little faster—at the rate of three numbers at least a week. It is true that this will make the title seem still more absurd; but this cannot be helped—its sagacious sponsors must pay the penalty of their own folly. And now to the merits of the work,

We are sorry to say that the remarks in our Number for March 1833, on the absurdity of an article in the Cyclopædia on the Accusative Case, have not been attended to in the proper quarter. In a list of errata, published at the end of the 1st volume, no notice was taken of the numerous and glaring errors, even in regard to the commonest rudiments of the Latin language, which were pointed out, with deserved indignation, in that number of the Mechanics' Magazine. Within the last week or two, an opportunity has been afforded to the same writer in the Cyclopædia (there can be no other so lost in Cimmerian darkness), of exhibiting his ignorance of Latin, in an article on the Auxiliary Verbs. "In the perfect subjunctive," says this learned Theban, "an older form, *amavesim*, may be inferred from the three existing forms, *amassim*, *amaverim*, *amarim*." If this writer will condescend so far as to refer to the common Latin Grammars he will find that *amavissem*, not *amavesim*, still flourishes *there as well as in* all Latin authors, whether ancient or modern; and that *amassem*, not *amassim*, is the abbreviation of it, as distinctly recognised as such, as *amarim* is for *amaverim*: and if all these be separate tenses, as he seems to think, we desire him to show us how they appear in the other conjugations besides the first—for, as we had to inform this gentleman some time ago, that there are more declensions of nouns than one, so we now inform him that there are more conjugations of verbs than one.

We are sorry that the Philological department should have fallen into the hands of this incapable blunderer, as we have long been convinced that it would prove a very advantageous feature in a new Cyclopædia, to give more room to this branch of study. We cannot see why a work of this kind should not furnish elementary information on the languages as well as in every other liberal portion of knowledge. Under their respective heads should be given Grammars of about forty or fifty of the principal languages of the world, with a Vocabulary of three or four hundred of the most usual terms, "air, heaven, earth, man, woman," &c.; and the Lord's Prayer, or some other short piece of composition, parsed and analysed, as in Adelung's Mithridates. Between two and three hundred pages of the many thousands of the Penny Cyclopædia would suffice for all this, and the advantages would be incalculable. So deficient is it at present in this kind of information, that we do not find, either under the head "Alphabet," or "Arabia," that very useful piece of philology, the Arabic Alphabet.

Having said so much in dispraise of the publication under review, we are happy to be able to bestow very high praise on another part of it. In the Geographical department there are indeed faults to find; the scale on which it is constructed is large, even in comparison with the large scale of the Cyclopædia altogether; too much attention is paid to the obscure towns of France, while in regard to those of England the most recent information has not always been obtained; maps are often wanting when they are needed, and when they are given, their execution does no credit to any of the parties concerned; but still, taken on the whole, this department is ad-

mirably well written, by one who is completely the master of his subject, rich in information, and ingenious in his method of imparting it. Many of the articles in this branch of study are not only first-rate, but the very best things of the kind we have had an opportunity of seeing: those who may think this commendation too warm, will do well to inspect the articles on Ætna, Archangel, Astrakhan, and we are confident they will thank us for the pleasure we have been the means of procuring them. To Biography and History there has been as yet less space allotted; but the articles on these matters are also equal, if not superior, to those in any other Cyclopædia we know. It has been objected to them, we understand, by some readers, that they are too learned. The fault is one which, in the present day, may be easily pardoned, as it does not seem likely to spread. Taken generally, the execution of the Penny Cyclopædia is now, and has been for some time, such as to reflect the highest credit on those who have the superintendence of it.

We feel the more bound to give this testimony in favour of one of the Useful Knowledge Society's publications, from having observed a tendency in periodicals, otherwise respectable, which are, like ourselves, opposed in principle to the plan of the Society, to shower one universal censure upon all its works, good, bad, or indifferent. We trust that our hatred of monopoly, however great it may be, will never prevent us from perceiving, or when perceived, from acknowledging the difference between a compilation of the records of crime and atrocity, pandering to the lowest appetites, such as the *Athenæum* describes Mr. Jardine's volume of Criminal Trials to be, and a valuable and useful contribution to jurisprudential literature, drawn from the most authentic sources, and illustrating some of the most important and interesting periods of our national history, such as Mr. Jardine's volume on Criminal Trials really is. Our opposition to this monopoly is fair; and we trust that our criticisms on its productions will be uniformly deemed fair also.

P. P. C. R.

AMERICAN RAILWAYS.

The country, which surpasses all others in the spirit and rapidity by which its means of inland transport have been improved, is the United States. The number and extent of railroads completed, in progress, or projected throughout the union, must surprise all who have not attended to the advances made by this country in the arts of life. We extract from a tabular view, published under the direction of Congress in 1833, the following list of railroads then executed and projected in different States:—

	Completed.		Projected.
Massachusetts	5	..	4
Rhode Island	—	..	2
New York	6	..	25
New Jersey	5	..	1
Pennsylvania	15	..	67
Delaware	2	..	—
Maryland.....	2	..	2
Virginia	2	..	5
North Carolina ..	3	..	3
South Carolina ..	1	..	—
Georgia	1	..	2
Alabama	2	..	1
Mississippi	—	..	2
Louisiana	1	..	1
Kentucky.....	1	..	—
Ohio..... ...	—	..	12
Indiana	—	..	8
Illinios.....	—	..	1
D. of Colombia ..	—	..	1
Total ..	46		137

From the above statement, it will be seen that the State of Pennsylvania takes the lead in the construction of inland communications. The earliest and most extensive railroad constructed in this State was undertaken by the government, and forms a continuation of the Union canal; stretching from the eastern to the western extremity of the State, and connecting the city of Philadelphia with the banks of the Alleghany and the Ohio. This great line of communication consists of three divisions; the first extending from Philadelphia to Columbia, which consists of a railroad constructed in a manner nearly similar to, and in some respects with a greater degree of stability than the Liverpool and Manchester road. Nearly the whole of it is formed of what is called the edge rail or rolled iron, similar to that used on the Wigan road; the weight of iron being 41¼ lbs. per yard, which is 6¼ lbs. more than the weight of the Manchester rails. The line is conducted very nearly level; the slopes being such that the effect of the power of traction upon the line is 71 per cent. of what it would be on a dead level of equal length. The road is conducted over

several rivers, which it intersects nearly at right angles; the valleys, where embankments could not conveniently be constructed, are crossed by 31 viaducts, the aggregate length of which is about a mile and a half. There are 73 stone culverts, from 8 to 25 feet span; 500 stone drains, 2 feet wide, and 3 feet high; 18 road and farm bridges, 8 of which have stone arches of 25 feet span, and the remainder stone abutments, with wooden superstructures of 31 to 54 feet span. The excavations are frequently deep, and the embankments lofty; in one place the road is elevated 80 perpendicular feet above the bottom of the ravine, and, in other places, cuttings of 40 feet deep occur.

From the extremity of this road at Columbia to Hollidaysburg, on the Juniata, extends the Union canal, by which the communication is continued. From Hollidaysburg to Johnstown, on the Conemaugh river, the railroad is resumed for a distance of 36½ miles. This line of road crosses the Alleghany mountains by a series of slopes, and by a tunnel 900 feet long, 19 feet high, and 22 feet wide. There are 400 askew viaducts, besides 72 culverts and other structures of masonry; the rails are similar to those on the Manchester railway, but are 4½ lbs. heavier, weighing 39½ lbs. per yard: the rails are constructed upon stone sleepers in the same manner as on the Manchester line, except on embankments, where wooden string pieces are used.

The little Schuylkill railroad extends from Port Clinton to the town of Tamaqua, a distance of about 23 miles. It is formed, like many other railroads in the States intended for light traffic, of wooden rails, shod with iron bars. Although the chief design was the transport of coals, it has been executed with a view to general trade, and stage-coaches, worked by horses, already ply on it.

One of the most important of the Pennsylvania railroads is that which extends from Carbondale to Honesdale, connecting the whole country, watered by the great branch of the Susquehanna, with the Hudson, and by that river with the city of New York. A canal commences on the Roundont, near its junction with the Hudson, and terminates at Honesdale, 106 miles from the town of Eddyville, on the Roundont, and 90 miles from New York. The railroad continues the line from thence to the coal-mines near Carbondale, on the Lackawanna. An act, authorising a railroad from the Lackawanna to the Susquehanna, has passed the legislature of Pennsylvania; and if that line be executed, an immense amount of merchandise will be conveyed along the Carbondale and Honesdale line.

The railroads of Pennsylvania are chiefly constructed in those districts which produce anthracite and bituminous coal. The greater number of these being adapted for low velocities, and light transport, are formed of wooden string pieces, which are sometimes shod with iron bar. In many cases the road follows the natural surface of the ground, and their construction is therefore attended with but small expense, especially in a country where the expense even of the best timber scarcely exceeds the labour of cutting it.

Another important railroad is that by which the cities of Philadelphia and New York are connected. This road commences at Camden, a town on the bank of the Delaware, opposite Philadelphia, and from thence it is carried nearly in a straight line to Amboy, at the mouth of the Hudson. The length of this road is about 60 miles; the rails are of rolled iron, similar to our best railroads, and 4¼ lbs. heavier than the Manchester rails, being 39¼ lbs. per yard: they are attached to stone sleepers, by pins at the sides, without chairs.

The Newcastle and Frenchtown railroad connects the Delaware with the Chesapeake, and forms the great line of communication between Philadelphia and Baltimore. This road is formed of wooden rails, shod with iron bars; the former are of Georgian pitch pine, 6 inches square in the section, and the latter 2¼ inches wide, and five-eighths of an inch thick, attached to the timber by iron nails. The entire length of this line is 16 miles.

A line of road, one part of which is called the Hudson and Mohawk, and the other the Schenectady and Saratoga railroad, continues the line of transport from New York by the Hudson, in a direction northward from Albany. A prodigious intercourse by steam-boats takes place between New York and Albany, on the Hudson. The line of railroad from Albany to Schenectady, a distance of 16 miles, has been constructed to connect this line of communication with the grand canal at Schenectady, by which it is carried from thence in a westward direction, a distance of about 250 miles, to the town of Buffalo on Lake Erie. From Schenectady the second branch of the railroad continues the line of communication in a northern direction, a distance of about 20 miles, to the shores of Lake George; from which, by Lake Champlain, there is a continuous water communication with the river St. Lawrence.

One of the most magnificent American railroad projects is that which has been entitled the Baltimore and Ohio railroad. This splendid line of communication will commence at the city of Baltimore and cross the State of Maryland in a westerly

direction, passing south of Fredericktown and the city of Washington, to each of which branches have been constructed. It will thence proceed to some point on the Ohio river, between Pittsburg and the mouth of the little Kennoway river.

The whole length of the road, from Baltimore to Pittsburg, will be about 330 miles. The most difficult and expensive portion of this railroad has, we believe, been already completed: it extends from Baltimore to a place on the Potomac river called the Point of Rocks, a distance of 70 miles. It consists of a double track; and it appears that, on the 1st December, 1831, the communication was opened between Baltimore and the city of Frederick, and has been continued without interruption since that time. The communication between the Point of Rocks and Baltimore commenced on the 1st April, 1832. The directors state, in their seventh report, dated in October, 1833, that they are justified in assuring the stockholders of their entire confidence in the final success of the work; that the practicability of applying steam power upon it had been satisfactorily ascertained; and that new sources of revenue, not contemplated by the original projectors, had been developed, by the opening of adjacent quarries, and the felling of forests, the products of which have become objects of transport upon the railroad. They had entered into a compromise with the Chesapeake and Ohio Canal Company, to carry the railway along the bank of that canal, to a place called Harper's Ferry; which distance, it was calculated, would be completed by the 1st of January, 1835. This section of the road, communicating with the Winchester and Potomac railroad, which likewise terminates at Harper's Ferry, opens a continued railroad communication between Baltimore and the rich valley of Virginia. The thriving and enterprising town of Winchester would thus be likewise connected with Baltimore; nor would it be too much to anticipate that the line of communication would be continued by Stanton, in a south-westerly direction, to the cotton districts of Tennessee; finding its way to the ributaries of the Ohio, and connecting, by a grand line of communication, the waters of the Atlantic with those which empty themselves through the Mississippi into the Gulf of Mexico.

In the autumn of 1830 was commenced a line of railroad, extending from Baltimore to the town of York, in Pennsylvania, a distance of 70 miles. This road is formed of wooden string pieces, shod with iron rails, 2 inches broad, and half an inch thick.

In 1831 was commenced a line of railroad to connect *the northern* and southern states, commencing at Petersburg, in Virginia, and terminating at Wolden, on the Roanoke. The structure is similar to that of the last-mentioned line.

The South Carolina railroad was commenced in the autumn of 1830, and nearly 100 miles of the line were completed in 1833. The road extends from the city of Charleston to the town of Hamburg, situate on the Savannah, opposite to Augusta. This is a single line of road 135½ miles in length. The plan is nearly straight, and the undulations extremely gentle; no slope exceeding 30 feet in a mile, with the exception of one inclined plane, which is worked by a stationary engine. The rails are flat iron bars, attached to strong wooden beams. These beams are supported throughout almost the whole length of the road on piles driven into the ground, secured also by strong ties. In some of the marshes which are crossed by the road, these piles are driven to a great depth. On this road there are but few embankments; the valleys being almost invariably crossed by viaducts supported by piles and carpentry. In fact, the railway is described as resembling a continuous bridge. Locomotive-engines have been for some time worked on this road. It is intended that this great line of communication shall be continued from Augusta to the Tennessee river, a distance of about 230 miles.

In our inquiries regarding the American Railroad Companies, we have been struck by the public spirit and candour which characterise the proceedings of our Transatlantic countrymen. This is especially conspicuous when we compare the meagre statements put forth by the Liverpool and Manchester Railroad Directors, with the copious and satisfactory reports published by the Baltimore and Ohio Railroad Company. The reports now before us, published between the years 1828 and 1833, occupy upwards of a thousand octavo pages, illustrated with numerous plans and tables. In these we find not merely the formal reports of the directors, but also the detailed reports of the engineers, and of the subordinate engineers to the engineers in chief. We find also the most minute details of the various contracts, with the names of the contractors. These details are not merely submitted to the stockholders themselves, but are laid before the public. The volumes in which they are recorded form a rich storehouse of knowledge for guidance in other similar enterprises; whilst the publicity thus given to every particular, operates as a check upon the spirit of jobbing. It is only by this carefully recorded experience, that we can hope to see this new and powerful means of transport brought to perfection.—Edin. Rev.

NOTES AND NOTICES.

Celestial Phenomenon. — On Monday evening (November 3), about eight o'clock, a singular luminous appearance was seen in the heavens, commencing near the western horizon; and, after extending in a continuous line through the meridian of the heavens, finally losing itself near the brilliant planet Jupiter, which then shone with resplendent lustre in the east, about 20° above the horizon. It presented the aspect of a beauteous transparent zone of light, of nearly equal width, from 6° to 7°, throughout the entire length of the line, and very much like the representations we have of the milky way. The stars were distinctly visible through this filmy structure, and here and there a vapoury cloud crossed it at right angles, presenting a similar appearance to the telescopic view of the belts of Jupiter. Whether this splendid heavenly phenomenon should be ranked amongst the meteoric, nebulous, or electric class, we cannot pretend to say. From the time we first observed it to the period of its disappearance, might be from ten minutes to a quarter of an hour; how long it had previously existed we know not, but it certainly was one of the most imposing and singular visitors ever before seen in this quarter of the globe.—*Liverpool Courier.*

Steam Threshing-Machines.—Mr. Burstall, an ingenious engineer at Leith, has introduced very extensively the application of high-pressure steam threshing-machines. These seem to be superior to the low-pressure engines in various respects. First, such engines are considerably cheaper in the original cost; secondly, they do not require more than one-twelfth or one-twentieth part of the water which is requisite for a condensing engine; and, thirdly, a knowledge of their management is more easily acquired. They are thus rendered more fit for farm labour, and when properly made are certainly as safe as, if not more so, than condensing-engines.—*Highland Society Transactions.*

Zincography.—The German work which we lately referred to (No. 583), as being printed on zinc, was published at the book-store of Leake, at Darmstadt. Each number consisted of twelve plates, folio, of architectural monuments, and was sold at the low price of five francs—about 4*s.* 2*d.* sterling.

Hindoo Literature.—A native Hindoo periodical called Bigyoua Sobadhi, or Treasures of Science, contains an introduction to mechanics, hydrostatics, and pneumatics, translated from the Library of Useful Knowledge, into the Bengalee language, under the direction of Mr. Wilson and Mr. Sutherland, successively secretaries to the Committee of Public Instruction.—*Globe.*

Nutt's Bee System.—Ten stocks of bees now standing in Mr. Nutt's apiary, at Moulton Chapel, near Spalding, have produced 808 lbs of honey this present season; and hives averaging similar quantities may be seen in an apiary at Gedney.—*Morning Herald.*

Benefits of Steam Navigation.—Previously to the introduction of steam-boats on the Mississipi, the amount of goods transported between New Orleans and the towns of Louisville and Cincinnati, was only 2,000 tons, carried in barges averaging 100 tons burden, and making only one trip within a year. The amount is estimated to be now 1,000,000 tons; the tonnage of the steam-boats employed in this portion of the trade on the Ohio and Mississipi alone being 8,400, and each boat making many trips in a year. This increase of trade has taken place in less than 20 years, as steam-boats were introduced on that river in 1817. A part, but, in proportion to the whole, a small part, of this increase, must be ascribed to the growth of population; and, moreover, the growth of population has itself been vastly accelerated by the trading facilities effected by steam-boats.—*American Paper.*

In-door Riding.—Mr. Galt, being incapable of locomotion, has invented a machine which gives him exercise somewhat similar to riding. Its appearance is handsome and simple; made of mahogany it would be an ornament to a parlour. It is of the form of a cross, the transverse beam moving on a pivot, like a balance. From each arm hangs a stirrup-iron, and on the top of the upright are two pullies, through which two cords are reeved, fastened to the extremities of the transverse beam. The unfastened ends hang down in front, with bell-pull handles. When using it, the invalid is seated in an elbow-chair, his feet placed in the stirrups, while he grasps the handles, and gives it motion by drawing the cords, raising and depressing the ends of the transverse beam. The inventor calls it a shelty—*alias*, a Highland pony, and says, since the dandy-horse is stabled in the "tomb of all the Capulets," it should become as immortal as Pegasus. —*Greenock Paper.*

Microscopes.—At a late sitting of the Paris Academy of Sciences, a comparison was made of the merits of different microscopes lately invented. M. Selligues, first, in 1824, constructed a microscope with achromatic glasses. M. Amici sought to improve vastly upon Selligues, and, after much thought and labour, produced a microscope that was valued at 1,000 francs. "Lebaillif (we translate the lively reporter of the *National*) that scientific amateur, who was wont to gather around him all the observers and artists of Paris, possessed a variety of microscopes. He purchased the new one of M. Amici. The magnificent instrument was placed on the table. How it eclipsed all the other microscopes! beggarly things that cost 50 crowns, whilst it cost 40*l.* But great was the disappointment of the observers—the light was lost in the complexity of glasses, and many objects became utterly undiscernible in the new microscope. M. Lebaillif, immediately seizing a few glasses and a tube of pasteboard, improvised a microscope far superior to this most expensive complication. M. Trecourt caught the idea, ground the glasses himself, and produced the reduced achromatic microscope. This has two systems of eye glasses; but its principal characteristic is its object-glass, consisting of three achromatised lenses. This triple mode is much preferable to the double of Selligues. This microscope costs 6*l.* sterling, with 1*l.* more for each magnifying system additional. By means of these, the microscope may magnify 2,250 times. But up to 1,000 times the object remains admirably clear and perfect."—*Athenæum.*

Communications received from Mr. Woodhouse (omitted to be acknowledged before)—Mr. Landale—J. B.—Carlos—Mashdoud Mohandez—K. M. K. —Myself—Mr. E. W. Baker—An Old Correspondent—Mr. Guest—Mr. Mackinnon—Mr. Hurley—N. W.—W.

The publication of the Supplement to our last Volume is, owing to an unavoidable delay in the engraving of the Portrait of the late Mr. Telford, deferred till the 1st of December.

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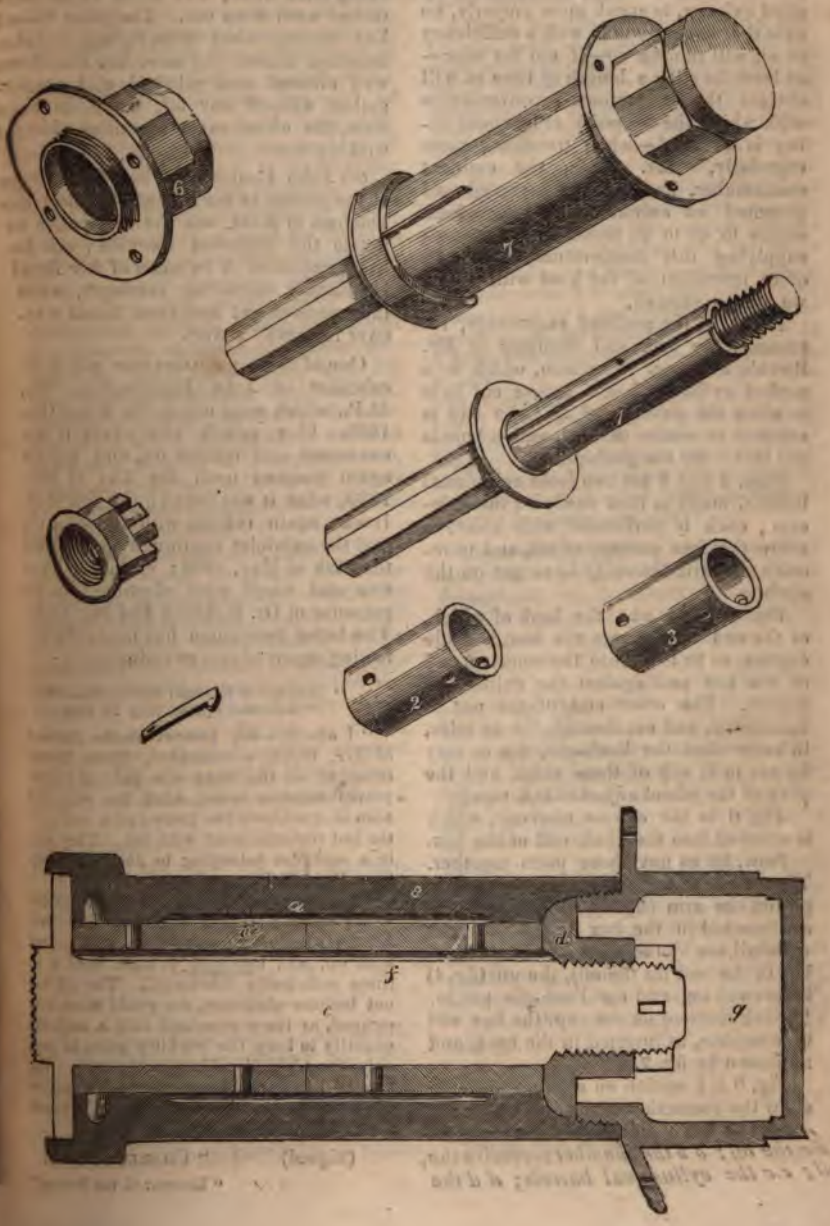
BIRCH'S PATENT AXLETREE AND BOX FOR CARRIAGES.



BIRCH'S PATENT AXLETREE AND BOX FOR CARRIAGES.

Many have been the attempts made to supply that important desideratum in coach-making, namely, a permanently oiled axle, or, to speak more properly, an axle that once supplied with a sufficiency of oil will remain so—if not for ever—at least for such a length of time as will obviate the numerous inconveniences with which the necessity of frequent oiling is attended—when travelling more especially, Mr. Birch, the eminent coachmaker, has recently invented and patented an axletree and box, which seems to us to go much farther towards supplying this desideratum, than any other invention of the kind with which we are acquainted,

Fig. 1, of the prefixed engravings, represents the arm and shoulder of Mr. Birch's axletree. The arm, which is a perfect cylinder, has a groove cut in it to allow the passage of oil; the end is screwed to receive the nut, and a hole is cut into it for the linch-pin.

Figs. 2 and 3 are two loose cylindrical barrels, made to turn easily on the axle-arm; each is perforated with holes, to allow the free passage of oil, and to receive any grit that may have got on the surface.

Fig. 4 is the nut, the back of which, or the end that meets the box, is made convex, so as to fit into the concave end of the box and against the cylindrical barrels. The other end of the nut is hexagonal, and cut through the six sides, in order that the linch-pin, fig. 5, may be put in at any of these sides, and the play of the wheel adjusted to a nicety.

Fig. 6 is the cap or reservoir, which is screwed into the linch end of the box.

Now, let us put these parts together. The cylinder barrels (figs. 2 and 3) are put on the arm (fig. 1), and, after these are inserted in the box (which latter, as we shall see by the section, has a chamber in the rear for the oil), the nut (fig. 4) is screwed on, and the linch-pin put in. Having screwed on the cap, the box will be complete, as inserted in the nave, and as shown by fig. 7.

Fig. 8 is a section on a larger scale, to show the connexion of the different parts; *a a* is the box which shows the channels for the oil; *b b* the chamber to receive the *oil; c c the cylindrical* barrels; *d d* the nut; *e* the axle arm, showing the chan nel *f*; and *g* the cap.

Mr. Birch had fitted up a gig with one of these axletrees, one wheel of which being once oiled, was never again disturbed until worn out. The other wheel had the cap taken from it, and ran six hundred miles; the arm, &c. was then well cleaned and polished, and put together without any oil, when, in this state, the wheel ran sixty miles without sticking fast.

Sir John Conroy, who has the charge of the stables of her Royal Highness the Duchess of Kent, was the first person to notice the improved axletree; and he has introduced it in some of her Royal Highness's travelling carriages, where the improvement has been found to answer remarkably well.

One of these axletrees was put to the cabriolet of John Ramsbottom, Esq., M.P., which went out on the 9th of Oct., 1831. One month afterwards it was examined and refitted up, and was not again touched until the 23d of May, 1833, when it was found quite full of oil. It was again refitted with the same oil, and the cabriolet continued in use until the 12th of May, 1834; when the axletree and wheel were examined, in the presence of Dr. Birkbeck and Mr. Toplis. The latter gentleman has made the following report of this examination :—

"Museum of National Manufactures, &c.
"Leicester-square, May 12, 1834.

"I was this day present on the premises of Mr. Birch, coachmaker, Great Queen-street, to see the state of a pair of his improved axletree boxes, after the same had been in use above two years and a half since the last replenishment with oil. They were in a cabriolet belonging to John Ramsbottom, Esq., M.P.

"There appeared to have been no partial wear; every part was free and uninjured. All the rubbing surfaces were well covered with oil, and appeared to have been at all times sufficiently lubricated. The oil had not become glutinous, nor could much have escaped, as there remained still a sufficient quantity to keep the working parts in good order for a considerable time to come. The oil was discoloured by the iron, but had no verdigris in it. The wheel was replaced without any further supply of oil.

(Signed) "CHARLES TOPLIS,
"Director of the Museum."

PORTATION OF MACHINERY.

—The extreme folly of our laws the exportation of machinery has eived a very remarkable illustra- You will probably be glad to re-

in the last few weeks an English- ought ten bobbin-net machines in and its neighbourhood (part of t least of French manufacture), ported them from the port of o Russia, taking with them work- enough to form the nucleus of blishment. As if to prove to the the legality of exporting ma- from France, the vessel in which re exported was hired for the pur- he mayor, who is the most consider- rchant of the place, and left the open day, multitudes of men, and children, being assembled ess its departure. These ma- are five of them levers, and the e, hand-circulars. It is said that orter intends, as soon as they are , to return to Calais, in order to e a number of rotary machines, ern construction, plenty of which being built there by both French glish workmen.

sir, the professed object of our to prevent foreigners obtaining ery similar to ours;—behold its Russians and Germans cannot achinery from England, so they e it in France. English work- e forbidden to supply the de- of foreigners, so French smiths orders, and English workmen, themselves where the demand h them, expatriate themselves.

Yours very respectfully,

J. C.

1834.

—Why do not the machine- of the kingdom, of all kinds, procure the abolition of these rohibitions?

THE DAVY LAMP.

Since I addressed you on the sub- e "working colliers" (p. 100), ner has published, in his fifth f the "Elements of Chemistry," ormation relative to the powers avy lamp; a knowledge of which is of great importance to all persons liable to be suddenly exposed to the action of an inflammable atmosphere. I therefore beg, through your valuable publication, to call the serious attention of all such persons to the following extracts from that work:—

"When the (Davy) lamp is carried into an atmosphere charged with fire-damp, the flame begins to enlarge, and the mixture, if highly explosive, takes fire as soon as it has passed through the gauze, and burns on its inner surface, while the light in the centre of the lamp is extinguished. Whenever this appearance is observed the miner must instantly withdraw; for, though the flame should not be able to communicate with the explosive mixture on the outside of the lamp, as long as the texture of the gauze remains entire, yet the heat emitted during the combustion is so great, that the wire, if exposed to it for a *few minutes*, would suffer oxidation, and fall to pieces."—Again: "If a lamp with its gauze red hot be exposed to a current of explosive mixture, the flame may possibly pass so rapidly as not to be cooled below the point of ignition, and in that case an accident might occur with a lamp which would be quite safe in a calm atmosphere."—This, then, may account for accidents in coal-mines where the safety-lamp is constantly employed.

These extracts, which I have restricted solely to the point at issue, show, that a dependance on the Davy lamp, under any circumstances, in an inflammable atmosphere, is extremely dangerous; for, according to Dr. Turner's statements, even in a calm atmosphere its protecting powers are limited to a very short time, and in an agitated one no reliance ought to be placed on it for a moment. After such a statement from Dr. Turner, after the published experiments of Mr. Pereira, and those made by several other eminent chemists, which are all confirmatory of its truth, surely nothing further need be said to show the necessity of immediate attention to this subject, nor any comment made on the cruelty and injustice of attributing all explosive accidents to the carelessness, or, as it has too frequently been termed, "the criminal obstinacy of the working collier."

Your obedient servant,

U. G. R.

London, Nov. 10, 1834.

THE RIGHT EMPLOYMENT OF WEALTH—MR. LOUDON IN EXPLANATION.

Dear Sir,—I have too great a respect for your correspondent Junius Redivivus, and sympathise too deeply with his generous and benevolent sentiments, not to reply at once to his communication to the Mech. Mag., p. 117.

Junius Redivivus is perfectly right in arguing, that there can be no such thing, on an extensive scale, as hoarding wealth. How I suffered an expression, implying a contrary opinion, to be printed, without being duly guarded, I cannot say. I am, however, much obliged by Junius's correction, and I shall have it immediately made in the stereotype-plates of the "Architectural Encyclopædia."

I am always happy to see the name of Junius Redivivus in your pages, and in those of the "Monthly Repository;" for whether he treats of mechanical art or moral science, he is always original and always interesting.

I remain, dear Sir,
Yours sincerely,
J. C. LOUDON.

Bayswater, Nov. 15, 1834.

MR. NUTT'S BOOK ON BEES.

Sir, — Trusting you will excuse my doing so, I again beg to trespass on your pages upon the subject of Mr. Nutt and his book. Mr. Nutt, in the preface to his work, acknowledges himself under the greatest obligations to the Rev. T. Clark, of Gedney Hill, and adds, "that but for his assistance the work would not have made its appearance in its present form, if, indeed, it had appeared at all. He has *revised*, *corrected*, *connected*, and *arranged*, the materials of which it is composed; and he moreover gratuitously added much that is original and valuable from his own rich stores of knowledge." After this Mr. Nutt says, "Perhaps I cannot more appropriately introduce the interesting subject of the ensuing pages to the notice of my readers, than by presenting to them in this place the substance of a dialogue between a learned Lord and myself, in which several particulars relative to bees are remarked upon and slightly discussed. It *happened* at the National Repository, and will, I flatter myself, not only prove acceptable to the apiarian reader, but will also supply the place of a more formal and laboured introduction." Mr. Nutt here says, or is made to say, that the introductory dialogue of his work took place between the learned Lord and himself at the National Repository; but what, sir, will you or the public say, when I not only assert but prove that a great part of this pretended conversation did not take place, but that, on the contrary, it is a most shameless plagiarism, and as gross an instance of literary piracy as was ever witnessed, being taken almost verbatim from a very popular work published nearly a century ago. Mr. Nutt, as the author of the work bearing his name, is answerable for the truth of the statements it contains; and when he was asserting that the conversation took place between the learned Lord and himself at the National Repository, he must have known the contrary to have been the fact. And although Mr. Nutt is most open to the charge of appropriating to himself the works of another, still, the person who *revised*, *corrected*, *connected*, and *arranged* the work, is amenable to the public opinion, and accountable for this glaring imposition practised on the public. Every one, however slightly given to literary pursuits, must have heard of that entertaining and instructive work, "Spectacle de la Nature;" it is this work that has been so unmercifully dealt with by Mr. Nutt (or his reverend coadjutor), and from which work have been derived such "rich stores of knowledge." The very plan of that work (a dialogue) has been adopted in Mr. Nutt's. In that work, the speakers are a Count, a Countess, a Prior, and a Chevalier; in Mr. Nutt's book, the dialogue is carried on by a learned Lord and Mr. Nutt in person. To convince you, sir, of the truth of the charge I have here brought against Mr. Nutt and his editor, I will, at the end of this letter, copy the extracts I have made from Mr. Nutt's work, and opposite to them I will insert the extracts from "The Spectacle de la Nature;" and when your readers have perused both, I will then leave them to judge, whether the

es I have brought against Mr. Nutt, and the corrector of his work, be true or I, however, imagine few will believe that such a singular coincidence of ns and form of expression could have been the effect of chance.

I am, &c.

J. P. T.

vember 10, 1834.

Ir. Nutt's Work. Pp. 10, 11, 12.

d.—Is it your opinion, that the honey bees gather from flowers is deposited cells without material alteration in ney ?

t.—I am apt to think that the bee no alteration in the honey, but col- his delicious syrup as nature produces d first fills her honey-bag, and then rges it into the magazine or cells pre- and appropriated for its reception.

d.—I am of your opinion in that par- , and could never observe that they le to condense the honey when it is too Perhaps it may be true, that when ceive it into their bodies, they purify ve it some consistence.

t.—The bees certainly act with more ity than ourselves, my Lord.

d.—Yes: the hive is a school to which rs of people ought to be sent. Pru- industry, and benevolence, public- dness and diligence, economy, neat- nd temperance, are all visible among es; or rather, let us say, they read us s upon these several subjects.

t.—As long as men are not influenced grace of God, they are certainly the njust and corrupt of all creatures.

d.—I cannot repress my indignation see to what prostitutions our species e themselves; especially when they sessed with the fury of ambition, or they are determined to live at ease, t giving themselves the least pain on their fellow-creatures barely possessed l and raiment. But let us close this eable subject; and though we find nners condemned by the practices of little insects—the bees—which asso- ith so much tranquillity and union, us go on to make them the subject of aminations; 'tis an article that in- delights me. I have seen your glass which are exhibited at the National tory.

"*Spectacle de la Nature:*" *translated by John Kelly, and others. Printed by James Hodges, London*, 1743. Duodecimo, vol. i. pp. 108, 109, 110.

Prior.—Your question is very pertinent, and deserves an answer. For my part, I am of opinion, that the bees make no manner of alteration in the honey, but collect this delicious syrup just as nature has produced it; first fill their bags, and then discharge it into the magazine.

Count.—I agree with you in that particular, and never observed that they were able, notwithstanding Virgil maintains the contrary, to give that honey which is too liquid a consistence.

Chev.—The bees, to our shame be it spoken, are much more temperate and regular than we are.

Prior.—A hive is a school, to which too many of the human species ought to be sent. Prudence, industry, love of our neighbour, zeal for the public good, economy, neatness, temperance, and, in short, all the virtues, are conspicuous in the bees; or, to speak more properly, they read us lectures on those moral subjects.

Prior.—As long as men are not influenced by the spirit of God, they are doubtless of all animals the most degenerate and corrupt.

Count.—I can't tell how to express my concern and resentment, when I see how shamefully our species degrade themselves by that inordinate ambition in particular of aggrandizing themselves, and living in affluence and ease, without showing the least compassionate regard for the necessities of their fellow-creatures. Here let us close this shocking scene; and though we find an absolute condemnation of our manners by the conduct of these little animals, who live in such uninterrupted peace and unity, yet let us proceed in our inquiries after them. 'Tis a subject that I am infinitely fond of. I have seen, Doctor, at your house, a glass hive, wherein you have told me several times you have had a swarm of bees.

STRAW PAPER.

Sir,—Since I forwarded my last communication, on the employment of fibrous vegetable matter for making paper, I have met with the following paragraph in the late T. C. Hansard's curious and ingenious work "Typographia," which I consider is well worth a place in your pages, as it very fully illustrates the subject recently under discussion between your valuable correspondent Enort and myself.

I remain, Sir,
Yours respectfully,
WM. BADDELEY.

London, Nov. 15, 1834.

"The great price which rags acquired some few years since, in consequence of the great increase of printing and the paper trade, induced many ingenious men to turn their attention to discover other materials for making paper. A very large manufactory was established some years ago, in London, for making straw paper at Millbank, by the river side; but the scheme proved abortive, and the premises were lately disposed of.

"In 1802, Mr. Matthias Koop invented the following method of making straw paper, for which he obtained a patent. For each pound of straw, or hay, a pound or a pound and a half of quicklime is to be dissolved in about a gallon or six quarts of river water.

"The hay, or straw, is to be cut into portions about two inches in length, then boiled in a considerable quantity of water, viz. about two gallons to a pound of materials, for three quarters of an hour. It is then to be macerated in the solution of lime and water for five, six, seven, or more days, taking care to agitate the mass by frequently stirring and turning it over. At the end of this time the lime water is to be drawn off, and the materials to be washed very clean, then boiled in a large portion of clean river water. This part of the operation is to be repeated; and, for the sake of improving the colour of the paper, 1 lb. of dissolved crystal of soda, or potash, may be used to every 36 lbs. of straw or hay.

"When the materials are pressed out of the water, the manufacture of them into paper may be proceeded with by the usual and well-known processes. In some cases the patentee has thought it advisable to suffer the materials to ferment and heat before *they were reduced to a pulp*, as was formerly *the case with the rags* for paper making. This, however, will always depend warmth of the season.

"When thistles are used, they cut down when the bloom begins t be dried and reduced into length inches; and then the same proce made use of, as has been already with regard to the straw and hay."

SITE FOR THE NEW HOUSE PARLIAMENT.

Sir,—Among all the numerou sitions that have appeared in th for a new site for the new House liament, I am rather surprised mention has been made of t which was submitted to the publ Mechanics' Magazine, about a c months ago. This was for buildi on the north or south side of a s be formed by the removal of the Admiralty, and the houses be and the river, so as to offer, on it side, a magnificent view of the and on its western, a view of St. Park. It must be evident to all familiar with the metropolis, or t of it, that, for the display of arc ral splendour, the spot now occu the street called Whitehall, and it diate neighbourhood, is *the* situat extensive park there approaches th of a superb river; and just at point where that river, by making opens a view not only of its bre its length, including, at the pr tance, a bridge more than twel dred feet long. And what adva taken of these opportunities? N street runs along between the r the park, but all that can be see river is an obstructed glimpse at of a street,—of the park anothe snatch under a low archway—a these not opposite to each other— objects are never *in presence*. I nothing in town architecture e this wilful throwing away of nities, except that other ingeni trivance of our ancestors, by whi converted the top of London Bri a couple of narrow streets, in w passenger would ever have s that any thing was rolling bene more dignified than a commo That error has long been rect hope that this other, scarcely l ous, will not long be allowed to

Much, however, as it is to be wished that some improvement may take place in this quarter, the public mind seems hardly prepared for any transference of the sittings of Parliament from the spot with which they have so long been historically connected. Nor does there, in fact, seem any strong reason for such transfer. By the removal of the old wooden houses between Westminster-hall and the Thames, a measure stated by the papers to have been determined on before the late calamitous fire took place; and by the removal of the Speaker's house, which there seems no adequate reason for connecting so very closely with the Houses of Parliament, sufficient space will be gained for the Committee-rooms, &c., necessarily appertaining to Halls of Legislature; while, on the old site of these halls themselves, new but enlarged and commodious ones may be erected. The whole building may stand one extensive isolated mass of public offices, comprising the seat of legislature and the courts of justice, with architectural façades on all the four sides — one of these sides, be it remarked, fronting the broad and noble river. This idea is, I believe, by no means new; but I do not recollect having seen suggested the importance of leaving between this building and the Thames a quay, or rather walk, by the water-side, open to the public. At present there is a space left, but it belongs to individuals, and the public are, of course, excluded. A slight expense might carry this river-side walk as far on as the foot of the Horseferry-road, where it would meet with the one called Milbank, already in existence; so that that long desired object, a Thames quay, would be formed from Westminster bridge to Vauxhall, no inconsiderable distance. It is singular that the former promoters of this now dormant project should not have endeavoured to carry into effect some scheme like this. They seem such determined despisers of "bit by bit" reform, that, finding they could not at one blow astonish London with a quay from Blackwall to the Penitentiary, they have thrown up the cards, and left the Thames, and all things thereunto appertaining, to lie "as they were." Surely this is not "absolute wisdom." Supposing they had marked every year that has rolled past since the broaching of their scheme, by making some little improvement—first, throwing open Somerset-house-terrace, for instance, then continuing it to the Temple Gardens—effecting an union between the Custom-house and the Tower quays, and so on—all which might surely have been effected with a tithe of the trouble and opposition to be expected in carrying the "Great Scheme." Do they suppose that great scheme would not have advanced in public estimation by this continued practical demonstration of its advantages? Do they suppose that his Grace of Northumberland, whose opposition is said to have ruined their former plan, would be equally powerful to thwart it, if they contrived to run two public walks, one up to one side of his garden, and the other to the other? A year or two of such a state of things would alter the case exceedingly; and the will of the Percies would, without the persuasion of an Act of Parliament, yield to the will of the millions. Besides, is there no medium between all Thames and no Thames? Must we have a quay of immeasurable length, or no quay at all? I trust the House of Commons, by opening a new one at Westminster, will take the first movement towards producing this great ornament to the metropolis, and show that even a moderate-sized quay may be a very good thing.

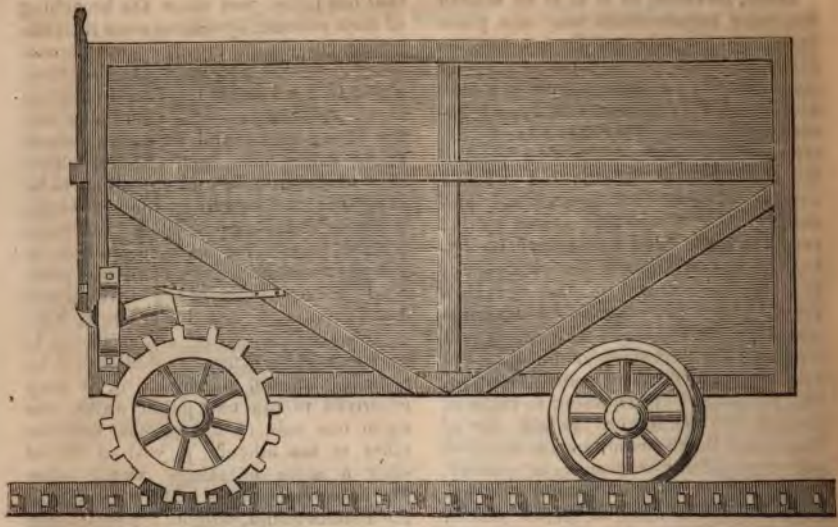
I remain, Sir,

Yours, &c.

P. P. C. R.

November 18, 1834.

P. S.—On perusing, in print, the article on the Penny Cyclopædia, which appeared in your last, I have observed, what I ought to have observed before, that the remarks quoted from the article on Auxiliary Verbs are intended by the writer to refer only to the perfect tense of the subjunctive mood, and not to the pluperfect also, as I had supposed—my remarks, therefore, made under that supposition, do not apply. The mistake is, by-the-bye, corrected by the quotation given in the review. With respect to the accusations founded on the article on the Accusative Case, there is no mistake.



IMPROVED CARRIAGE-STOPPER FOR INCLINED PLANES.

Sir,—I am perfectly convinced of the propriety of Mr. Deakin's remarks, the value of which has induced me to forward the accompanying sketch of a stopper, to prevent the descent of carriages upon *inclined planes;* one of the advantages of which will be, that *several* of them may be introduced, if required, in the *same* train, thereby dividing the load, or *preventing danger*, if any of the coupling chains should break. The falling catch (the action of which may readily be perceived) has a spring to press it upon the wheel, and secure a correct movement. The rod behind is for the purpose of raising the catch, if not in use, as upon the levels, which may be changed by a very simple contrivance, and save the necessity of doing it by hand. The teeth of the rails would be preferable, and are designed for the inside, but are here shown for convenience of delineation. Trusting I have not trespassed upon your limits and patience,

I remain, Sir,

Your obliged servant,

JAMES WOODHOUSE.

Kilburn, Oct. 31, 1834.

THE PORTLAND BREAKWATER.

Sir,—Mr. Harvey, in his letter of the 7th instant, in the 588th Number of your Magazine, does not state the result of my communication to you in the 586th Number fairly. Mr. Harvey says, "Mr. Lamb's case is, that it was he who in 1812 *first* conceived the plan, and suggested it to Mr. Idle." Now, what I did say was this, "It was impossible for me to say that Mr. Harvey, sen., had not thought of, and even proposed, such a work prior to 1812;" but that I could assert with truth, and now repeat, that if Mr. Harvey, sen., or any other person, ever suggested such a work prior to that time it had not come to my knowledge.

The case which Mr. Harvey has undertaken to substantiate, on the part of his father, divides itself into three distinct propositions, namely:—

First, that a pier, or breakwater, was designed and matured by his father many years before 1812.

ondly, that in 1813 he communi-
it to Mr. Abraham Bracebridge.
dly, that it was then submitted
. Bracebridge to Mr. Idle, by
Mr. Lamb was afterwards em-
as solicitor merely in the business.
evidence which Mr. Harvey pro-
to establish these three propo-
are, Mr. Bracebridge's letter of
h of August, 1813, and an ex-
f a letter from the late Mr. Har-
Sir John Cox Hippesley, Bart.,
September 19, 1814.
n Mr. Harvey's previous publica-
your Number (355), and the do-
ts now published, it should seem
aptain Bennet, as well as Mr.
y, had, many years prior to 1812,
ved a plan of creating a harbour
land; but it does not appear that
arvey's plan had been *matured*.
uld seem also from Captain Ben-
etter, that the subject had re-
the consideration of the Ministers
ate Majesty George the Third, as
k as the residence of that sove-
at Weymouth, which I cannot
r as a very encouraging circum-
The Bay of Portland is no
one of the finest bays in the
h Channel, and capable of being
ted into a harbour at less expense
'orbay, which has often been sug-
as the most convenient rendez-
or the navy. (On some future
n I will furnish you with a few
tions respecting this and other
rs to the westward of Portland.)
acebridge, in his letter, says, Mr.
had mentioned the subject to
veral months prior to the 13th of
, 1813; Mr. Harvey, in his letter
19th of September, 1814, says,
s mention of it to Mr. Bracebridge
o or three years prior to the 19th
tember, 1814; and I am, from
stances, inclined to think Mr.
's statement is the correct one.
acebridge's letter is also evidence
v that he, on the 13th of August,
applied to Mr. Harvey for par-
; but these letters certainly do
ve that Mr. Harvey either fur-
or even possessed, the particulars
for. On the contrary, Mr. Har-
the 30th of September, after he
en Mr. Dodd's survey and repre-
n, and after Mr. Dodd's *plans*
tions *were lodged with the clerk*
of the peace, writes, Mr. Bracebridge, "I am using my best endeavours to make calculations and complete drawings of the work, &c., which shall be at your service whenever you wish it," &c. For what purpose was Mr. Harvey to make these drawings and calculations? Clearly for some other person and purpose than those which Mr. Dodd had perfected and shown to Mr. Harvey.

Mr. Bracebridge's letter, and the extract from Mr. Harvey's of the 19th Sept., 1814, are equally deficient, if used for the purpose of showing that Mr. Bracebridge made any communication to Mr. Idle; for what says Mr. Bracebridge on this point—"I cannot but conclude that all your members will give their best assistance; but I think I can answer for one, who is a gentleman so well skilled in such matters, and of so great connexions, that I rest much upon him." Now Mr. Bracebridge had no personal acquaintance with Mr. Idle; if he had, he would have known that Mr. Idle would not have given his support to his, Mr. Bracebridge's, obvious object of launching a prospectus for a Joint Stock Company, on the information he sought to gain from Mr. Harvey, and which Mr. Harvey, on the 20th of Sept., tells him shall be at his service as soon as he has completed it.

From the evidence furnished by Mr. Harvey, it appears, that the idea of converting Portland Roads into a harbour is as old, at least, as the visits of his Majesty George III. to Weymouth; that Capt. Bennet had, many years before he commanded the Rover Packet (to which he must have been appointed before 1792), entertained a strong conviction that Portland Roads might be rendered far superior to the port of Cherbourg; that Mr. Harvey thought of a breakwater in 1794, and frequently named it to gentlemen without any good effect; that, in 1811 or 1812, he named it to Mr. Bracebridge; that Mr. Bracebridge, on the 13th of August, 1813, wrote to him for the plans, soundings, and various requisite materials, which he, Mr. Bracebridge, understood Mr. Harvey had in his possession; that Mr. Harvey, on the 30th of Sept., replied he was preparing them; but it is evident they were not intended for Mr. Idle. Mr. Harvey had seen these of Mr. Dodd's, and knew they were prepared by the sanction and for the use of Mr. Idle, and

must therefore have known that Mr. Bracebridge was acting independently of Mr. Idle. He appears, however, to have been equally ready to serve either; for he was kind enough, when Mr. Dodd, Mr. Dessiou, and Mr. Watkins, were down in October, to order his son (probably your present correspondent) to assist Mr. Dodd and Mr. Dessiou in taking the bearings, distances, and elevation of the island of Portland; and I think young Mr. Harvey was assisting, on board Mr. Sizard's boat, when the soundings of the bay were taken by Mr. Dessiou and Mr. Watkins, for what we then believed to be the *first* chart of Portland Roads that had been made from actual survey. I have seen none of an earlier date yet; and as it was then understood to be the first, it was dedicated by Mr. Dessiou to the Lords of the Admiralty.

It is true Mr. Harvey furnished Mr. Dodd and Mr. Dessiou with much useful local information; but it is quite possible that, while he was assisting in one way, he was gaining in scientific information, for his friend Mr. Bracebridge, a fair equivalent.

Mr. Harvey has failed to establish any of his propositions.

He has failed in proving that his father had matured a plan of a pier or breakwater in Portland Roads, many years prior to 1812; on the contrary, Mr. Harvey's own letter of the 20th of Sept., 1813, proves that it was not matured even at that time.

He has not proved that his father communicated it to Mr. Bracebridge in 1813; on the contrary, his father's letter proves that his conversation with Mr. Bracebridge was in 1811 or 1812.

He has not proved that it was submitted by Mr. Bracebridge to Mr. Idle; on the contrary, Mr. Bracebridge does not venture to say that he has been in communication with Mr. Idle, or even to mention his name; and his mode of speaking of the member on whom he rested so much, might well lead one to doubt whether he alluded to Mr Idle. Mr. Idle was a gentleman who had raised his own fortune, and had no great connexions, therefore, if Mr. Bracebridge did allude to Mr. Idle, it shows how little he knew of him.

In September, 1814, when Mr. Harvey wrote to Sir John Cox Hippesley, he, Mr. Bracebridge, and all the gentlemen with whom they were acti
have been aware that they
establish a joint-stock compar
Mr. Idle's interest, who, it
known, proposed to have the
cuted by commissioners appoint
Crown, which accounts for M
bridge's silence, as his proje
joint-stock company was defeat

If Mr. Harvey meant Sir J
Hippesley to understand that t
cal measure, which Mr. Idle
engaged upon, was the very s
sure which he had thought o
years before, he was mislea
John; but if Mr. Harvey mea
say that he had twenty yea
thought of a breakwater, and t
he first thought of it he had ne
it mentioned, or suggested, by
person, I give him full credi
declaration; but I claim equa
when I assure your correspond
the idea crossed my mind pre
the way I have already stated
Mr. Idle had not afterwards re
the subject, it is highly pro
should never have thought of
As it is, I never attached an
quence to the suggestion of a
obviously useful, though I have
claim, some credit for the time
and expense, I have bestowed
and for which I certainly had
assurance he would use his in
procure me such an appoint
should be a fair equivalent for
he believed, and as I still beli
the surveys, reports, charts, pl
tions, and specifications, whic
had made, were the first that
published, and contain accurate
ficient information for all the
they were intended for.

Had Mr. Harvey possessed
warded to Mr. Idle, or had
Cox Hippesley communicated
Idle, Mr. Idle would have beer
in acknowledging such a com
tion, especially from one of
stituents, and that constituent
respectable and respected ind
and I particularly have reason
Mr. Harvey's neglect or inabilit
that, if such a communication
made, it would have saved me
derable expenditure in both t
money.

What gentlemen Mr. Bracebr

mmunication with, or what progress made in the project of a joint-stock any for executing the breakwater, w not. He certainly was not in com- ication with Mr. Idle; and this I good reason to know, not only from intimacy with Mr. Idle, but it so ened that Mr. Bracebridge and his s were in such a situation, in 1813, very few days passed without his in my office, where he would have fficulty in learning all that passed e subject of the breakwater; there o mystery or secret respecting it; e, I have no doubt, obtained copies Reports of Mr. Dessiou, Mr. Dodd, Mr. Watkins, which were distri- without any reserve, to any person ssing to take any interest in the sub- and, as far as I am capable of ng, they contain the fullest and specific enumeration of the advan- of, and the facilities for construct- harbour at Portland, that I have een.

the "Suggestions" published by n January, 1826, after my visit to nouth and Lord Exmouth, in Dec., I endeavoured with the assistance late Capt. Foulerton, one of the brethren of the Trinity House, and iend Mr. Heathfield (who has lately ed confirmation of the general ac- y of those suggestions from a civil eer, a friend of his own), to concen- he substance of these Reports, and bservations of Lord Exmouth as as possible; but I do not find, on n, that any thing of importance has mitted.

le was, indeed, said on the subject Navy, from respect for the Lords of dmiralty, as we were aware that were amongst their Lordships some erfectly understood and appreciated easure.

estimates were revised by the as- ce of Mr. Dodd, for whom I was soliciting a patent for a Branch of which I send you the draught spe- ion, as a better thing than that of ames Riley of Boston, described in 4 of your 586th Number, and as g in some degree your views.*

I am, Sir, &c.

A. LAMB.

nchester-buildings, Nov. 17, 1834.

shall give a description of this in an early r.—ED. M. M.

THE PHILOSOPHY OF VEGETATION.

Sir,—Imperfectly as the wonders of the vegetable world are known, the labours of some of our best analytical chemists have thrown considerable light on the subject; all who have entered upon this extensive field of research, have expressed themselves utterly astounded at the number of the operations which they have discovered must be going on at the same time, and at the perfect order and skill with which each is conducted. In this paper I will endeavour to show those of your readers who may not hitherto have interested themselves on the subject, the nature of some of these changes which take place in the seed previous to its assuming the appearance of a plant, what food is necessary for its support, and how that food is prepared for its nourishment.

The doctrine of *equivocal generation*, as it was termed, is now completely overturned, and it is by all agreed, that every plant must arise from seeds. When placed in a favourable position, a seed is soon found to undergo changes—the radicle becomes a root, and the plumula a stem; but in this process, which is called germination, there is required a determinate supply of heat, water, and oxygen, or a species of air containing that vital principle. Scheele found that seeds would in no case germinate without oxygen; and M. Humboldt ascertained that, when moistened with aqueous chlorine, they vegetate more rapidly, which must be in consequence of the liberal supply of oxygen, as chlorine is well known to decompose water.

It seems that light is rather unfavourable than otherwise to germination; as Ingenhauz and Sennebier inform us they found, by several trials, that beans and other kinds of grain germinated much faster in the dark than when exposed to light; but the Abbé Bertholin objects to these conclusions, and affirms that the agency of light is not the reason, but the difference of moisture, water evaporating much faster from seeds in the light than in the dark.

After a seed has imbibed a sufficient quantity of water, it begins to discharge carbonic acid; and if the requisite supply of oxygen be present, this emission is considerable, but if there be a lack of

this element, the germination of the seed will cease. The oxygen gas, it must be observed, is not imbibed by the seed, but is wholly employed in combining with the carbon furnished by the farinaceous matter stored up in the outer covering of the seed, viz. in the cotelydons.

Although water is so absolutely essential to the process of germination, as neither of its elements can be discovered to be emitted, we may conclude that it has not been decomposed; but, as Dr. Thomson says, it would not be surprising if a portion of water, so far from being decomposed, were actually formed by the union of its constituents previously existing in the grain. We see the proportion of carbon continually decreasing; therefore, unless water were formed, the proportions of oxygen and hydrogen would be found proportionably augmented.

Sugar is also formed, as we have abundant evidence in the process of malting, and to the production of this substance must be referred the phenomena of the spontaneous combustion of hay which has imbibed moisture, the heat being caused by the fixation of oxygen in the newly-formed saccharine matter. At this stage of the process of germination, a fresh apparatus is required in the cotelydons. Accordingly, a quantity of vein-like vessels make their appearance, which are intended by nature to carry nourishment to the radicle, which now becoming a root strikes into the ground, and from it extracts the future nourishment of the plant.

Now can we conceive any thing more beautifully simple than this careful nursing of the embryo plant? How nearly allied is it to animal life! The mother takes not greater care of her newly-born offspring than *dame Nature does of her vegetable children*. But to continue—

The cotelydons, which now become seminal leaves, are still as necessary as at first to the young plant, although their own nourishing powers are exhausted; they must therefore *digest*, as it were, the food supplied by the root, and, by producing some unknown changes in it, make it fit for the purposes of vegetation; for at this time, but not before the plumula begins to expand itself into *branches*.* As the branches and leaves increase, the seminal leaves decay, and having performed their office, drop off, and the seed becomes a plant.

Plants, after germination, increase in size with more or less rapidity; new matter is continually added; hence to supply this, some sort of food is necessary. For a long time it was a favourite idea with chemists, that the sole food of plants is water; but there is, without doubt, something else required, as when made to vegetate in pure water, *they never perfect their seeds* (the experiments of Hassenfratz, Jaussure, and Duhamel, are our authorities for this assertion). How, it may be asked, can water supply the carbonaceous matter? It must be obtained from the atmosphere, which is always more or less impregnated with carbonic acid, the resolution of which into its elements, carbon and oxygen, may be easily conceived; but by what mode of operation the free carbon is received into the plant, we cannot pretend to offer an idea.

Another part of the food of plants are various salts: thus, nitrate of soda is found in barley, nitrate of potash in nettles; clover thrives best in soils containing sulphate of lime; sea plants will not grow without muriate of soda; we may imagine these salts to act as stimulants to the plant.

Various earths are likewise to be met with in plants; and, what is most extraordinary, they appear to be actually formed during the process of vegetation. Schrœder raised corn in pure sulphur, and watered it with carefully distilled water, yet the analysis of it afforded him more earthy matter than the corn from which it had grown. Braconnot's experiments coincided with his own. Hence it appears, that water, carbon, oxygen, and certain salts, are the chief food of vegetables. I fear I have already trespassed too much on your pages, and shall, therefore, reserve the continuation of these remarks to another month. In the mean time,

I am, Sir,

Your obedient servant,

ω.

Bath, Nov. 13, 1834.

* *In a common lupin*, or garden bean, *these different changes may easily be observed.*

TWIN STEAM-BOATS.

—I am very unwilling to fill up aluable pages with discussions of roversial nature; but from the ıd manner of Mr. Aldersey's reply e remarks of mine about his pro- twin-boat, I cannot, in common to myself, allow him to escape t showing how very much he has and garbled my short remarks; doing so, I shall endeavour to be ise as possible.

ıe first place, then, Mr. Aldersey hat there is a considerable discre- in my first observation, that there thing *new* in his twin-boat; while next page I say, the only *improve-* ı Mr. Aldersey's boat is that the ourse is parallel from end to end. ng that there was nothing *new* in Captain Forman's or Mr. Alder- lans, I made no reference what- the Dundee ferry boats Union eorge the Fourth. In the next ıowever, when speaking of those I said, "the only improvement dersey proposed was making the ourse parallel from end to end." ir, Mr. Editor, to place in juxta- two sentences that have no con- whatever in my original remarks? s it follow that the parallel water is new, because it is not applied boats in question? I heard parallel water course ("or two ats kept asunder by beams and many years ago.

Aldersey next proceeds to ask me bow rudder, made to hang fore , and swing and steer precisely on ıe plan as the rudder at the stern, new?" And then he dogmati- nswers the question himself by g, that he is quite sure it is new nless I had seen it in a publica- his in the United Service Maga- February 1833. Not having the of Mr. Aldersey's acquaintance, sk by what sort of second sight know the extent of my informa- I have neither read nor heard of blication in question, and yet *I n exactly such rudders at work for thirteen years!* They are at- to the ferry twin-boats already ed; they work very well, and by em both *at once, the boat can be in a very short space.* These rudders have been minutely described by Captain Basil Hall, in a publication of his in some of the scientific periodicals, I forget which.* Mr. Aldersey concludes his first paragraph by assuring us, "that it is the utility and superiority of the twin-boats over single-bodied steam-vessels that he advocates, and not their novelty." If this were the case, why feel so sore at my proving they are not new? Why take such pains to select sentences from different subjects, and clash them together to form "a discrepancy in my observations?"

The observations that next follow resolve themselves altogether into a difference of opinion betwixt Mr. Aldersey and myself, and are of little consequence to your readers. I shall, therefore, not occupy your space by going into detail, but will only remark, that Mr. A. will find some of the best of the Scotch boats, sailing in calm weather, one-fourth slower than the velocity of their paddle-wheels; and all Mr. Aldersey's *assertions* and rigmarole reasonings have not convinced me, that his "twin cut-waters" will offer so much less resistance to wind and water, as will enable them to double their speed with the same proportion of power to their tonnage. I admit that it is possible to make a boat sail at the rate of twenty-four miles an hour, but not with the speed of wheel, nor the moderate power, Mr. Aldersey seems to expect. He has still prudently (I see he understands the word) withheld the power necessary to drive his wheel or boat (which ever he likes to call it) at the rate proposed.

In Mr. Aldersey's original communication, he concluded with an opinion, that the "public were not aware of the advantages of a rotatory over the reciprocating motion of the oar" with manual labour. I maintain, from actual experience, that, under such circumstances, the oar has the advantage, and this fact is generally understood amongst people conversant with the subject. Mr. Aldersey can convince himself at a very trifling expense; and I would advise him to do so, before he attempts to force his theories forward without practical proofs; for so long as he supposes a paddle-wheel will urge a boat forward as fast as the motion

* In the Mechanics' Magazine, vol. iv. p. 205. —Ed. M. M.

of itself, so long will he remain blind to its imperfections.

The waste of power occasioned by immersing the float-boards (to say nothing of the back-water) is much more than what is lost by the back stroke of the oar, for the natural motion of our limbs is reciprocating: hence we are enabled, in a given time, to exert a much greater quantity of force, if applied intermittingly, than we could do were the force constant. The natural motion of the wheel is continuous, and when manual labour is applied to it, that loss of power takes place *which is always lost when converting a reciprocating into a rotary motion;* add to this, the very ineffective manner in which the wheel acts, and the uncertainty of its taking a proper hold of the water where there is the least undulation, and the superiority of the oar over the wheel with manual labour, must be obvious. Men's minds have been on the rack, for many years past, to substitute something better than the paddle-wheel for steam-boats, well knowing how very ineffectual it is, compared with other methods of propulsion. Mr. Aldersey, however, looks over these, and is for substituting wheels for oars on such boats as the Thames wherries. Does he imagine that a propeller so much more convenient would not have been adopted long ago, if it had been even *equal* to the oar? I do not think we are so bigoted, nor so attached to old schemes, as that. Suppose Mr. Aldersey's boat in operation as he expects, there is another disadvantage attending it, which he does not seem to have taken into account. In a head sea (of the moderate extent of four feet difference of level between the top of the wave and the trough), the "breast-board," as Mr. A. anticipates, would have the effect of raising the bow; and if the stern should at the same instant be about the trough of the sea, the wheel would then be buried four or five, instead of two, feet in the water—*vice versâ*, and the tremendous wheel is whirling in the air. (I would advise Mr. Aldersey to attach a governor to his engine.) The pitching that may be expected from a boat sixty feet long, in moderate weather, would produce much irregularity, and consequent loss of power.

I did not intend, when making my first *remarks, to point out* the many defects *in Mr. A.'s boat;* but his ill-tempered reply has induced me to say more. I found no fault with his boat—on the contrary, I approved of some of its arrangements. I only told him where he would see something very like what he proposed; and ventured to differ in opinion as to the motion necessary for his wheel, &c. I have neither time nor inclination to enter into a controversy with him (but I will not be abused). I have shown how Mr. Aldersey has perverted the meaning of my remarks, and have done with him, as no good can result from *angry* discussions on scientific matters. I am, Sir,

Your most obedient servant,

D. LANDALE.

Wemyss, Nov. 9, 1834.

Sir,—Having seen in No. 577 of your Magazine, a suggestion for the introduction of twin steam-boats by Mr. Aldersey, and also Mr. Landale's remarks on the same, I beg leave to offer a few words on the subject.

I would ask Mr. Aldersey, when he talks of twin steam-boats answering at sea, whether he ever saw what sailors term "blue water?" If he had, he would never surely have spent so much useful time in planning a scheme so futile. I speak only, be it observed, Mr. Editor, of its practicability at sea; on rivers it may answer extremely well, "perhaps;" but even if one were constructed to run between Richmond and London, I should not be at all surprised at finding, some fine morning, a notice up at the place of starting, that the twin-boat "cannot go to-day owing to the weather being so rough in Chelsea Reach."

Mr. Aldersey states, that the whole of the parts "must be put together with the most cautious attention to every point which can give the greatest degree of strength for binding the boats together, so as to make them in all respects inseparable from each other." This passage Mr. Aldersey puts in italics, the better to impress it on the attention of the reader. All that I shall say on this point is, that had Mr. Aldersey striven all his life to produce a machine for trying the relative strength of materials, he could not have succeeded so well as by this plan of binding two vessels to-

to stand the shock of a head sea. ldersey recommends the adoption n-boats between Calais and Lon- I would ask him, if he ever made assage across channel to Calais, ound the water even approaching mness? If he has, it is more than e; for the great bodies of water continually in from the Atlantic rom the North Sea, together with evalence of south-west winds, al- always produce that short trying hich is found so injurious to sea- vessels, and would be much more Mr. Aldersey's twin-vessel, as it catch more of the swell rolling channel on her broadside. I would venture such a vessel in the long off the Cape, than in the passage he Nore to Calais; and both would ually dangerous. In another part paper Mr. Aldersey states, that calculable advantage which at- itself to a twin-boat, is that it with perfect safety carry a much r proportion of sail, probably or four times more than any -bodied vessel of the same tonnage. eason is clear—so says Mr. Alder- but I must own that I cannot per- myself that it is so clear as he nes. His reason is as follows: win-boat is not liable to rotary n, therefore cannot be upset. (So own he is correct.) And, under a pressure of sail, upon a wind, the rd-boat would be pressed down in ater bodily; and before this would lace, but for a few inches, it must arily act on the windward boat, way of raising it to a less draught ter, by which means the windward- would act as an out-rigger," and the leeward-boat upon a level. ow *long* would the windward-boat such an out-rigger? Mr. Aldersey depend upon it that it would part ny with its other half before it had t sea many minutes; and the one ward would find its Siamese com- n hitting her in the ribs, to the al disadvantage of both. If Mr. sey intends to make his boats so that nothing shall separate them, e assure him that he will find but room for his water-way, as he it. Mr. Aldersey states farther, *she would possess advantages in "before as well* as upon the wind." But did Mr. Aldersey ever find two vessels sail at the same rate, if even built from the same model? If he has not (I know he cannot say he has), the one vessel going at a greater rate than the other, must inevitably produce an immense strain on the binders: and when two vessels are placed broadside together upon a wind (as in Mr. Aldersey's plan), the one to windward must take the greater portion of wind from the sails of the one to leeward, and consequently produce the same action as when running before the wind. Let Mr. Aldersey go up into a ship's top-gallant cross-trees, when upon a wind, and look down upon her hull, and he will come down with a different idea of the practicability of twin-boats at sea. I would recommend him to do this, before he again writes to your Magazine on this subject.

The next plan of Mr. Aldersey's which I cannot comprehend the use of, is his bow-rudder, which he seems to think so much of, that he has republished the account of it in the Nautical Magazine. I would advise him to take the opinion of the editor of that valuable Magazine; for, as a nautical man, he is very capable of judging of the merits of the plan. I think that any seaman must laugh at the idea of a rudder placed on the bows —that part of a ship which is more exposed to danger than any other. To use the words of the editor of the Nautical, "the inventor may rest assured that Old Neptune, or some of his Tritons, would soon ease any vessel of this unnecessary and unsightly appendage." Pray, how would Mr. Aldersey's rudder act when meeting a field of drift or sargossa weed, such as is often met with at sea? Only think again of the tricks the cables would play with it when riding in a tide-way.

If Mr. Aldersey still persist in pressing the adoption of his plans for sea-going purposes, I would advise him to put his vessels in the "Cork" trade, and recommend him to pay a visit to the National Gallery, and choose the best description of "life-raft," as a necessary equipage to take to sea with him.

I remain, Sir,

Your obedient servant,

E. W. BAKER.

Dover-road, Nov. 5, 1834.

NOTES AND NOTICES.

"Arboretum Britannicum."—We observe that a new work, under this title, is announced to appear in monthly parts, from the pen of our esteemed and indefatigable friend, Mr. Loudon. It is to contain pictorial portraits, on a scale of a quarter of an inch to a foot, of all the trees which endure the open air in Britain; and these portraits are to be taken from trees of ten years' growth, now actually growing within ten miles of London. The letter-press will contain scientific and popular descriptions of all the species figured, directions for their propagation and culture, and observations on their uses in the arts, and more especially in landscape and gardening. We are glad to see that a work of such great and obvious utility has been undertaken by one so eminently qualified to do it justice as Mr. Loudon. There are two very important things which it will accomplish; in the first place, it will show what planters may reasonably expect in even the short space of ten years, where the soil is properly prepared; and secondly, it will show architects, builders, and others, who are their own landscape gardeners, not only the sizes, but the shapes, which trees attain in that period; and this by reference to existing trees that any one may examine. It will hardly be credited that there are upwards of a hundred different sorts of trees in the Horticultural Society's garden at Chiswick, which have attained the height of thirty feet in the short space of ten years.

The present week being the Almanac week of the season, has brought with it an unusually plentiful supply of this very useful class of Annuals. We have not leisure this week to scan the merits of all the numerous specimens of the genus which have been sent to us, but we shall endeavour to do justice to them all in our next.

Sir Isaac Newton.—Dr. Chalmers, in speaking of Sir Isaac Newton, observes, "that it was a distinguishing and characteristic feature of his great mind, that it kept a tenacious hold of every position that had proof to substantiate it; but a more leading peculiarity was, that it put a most determined exclusion on every position destitute of such proof. The strength and soundness of Newton's philosophy was evinced as much by his decision on those doctrines of science which he rejected, as by his demonstration of those doctrines of science which he was the first to propose. He might easily have palmed loose and confident plausibilities of his own on the world. But no, he kept by his demonstrations, his measurements, and his proofs."

Influence of Colour on Heat.—Sir E. Home made experiments which showed that the *scorching* effect on the skin, which takes place by the sun's rays through semi-transparent white cloth or linen, is prevented by the absorptive power of black cloth; or, again, that it strikes through the transparent skin of the white, but is absorbed by that of the negro.—*Professor Powell, Ed. Phil. Jour.*

A New Thrashing Machine, which is worked by manual labour, instead of by horse power, has recently been introduced into this county from Norfolk, and found to possess all the advantages of the horse machine. It employs eight men, four of whom turn two windlasses, which supersede the horse-wheel; it thrashes the corn quite as clean as the old machines; and in substituting human labour for brute power, it obviates the powerful objection to which the former improvement was obnoxious, of diminishing the employment of a redundant population.—*Stamford Merc.*

Oxy-hydrogen Night-Telegraph. — According to announcement, a Mr. Coad, a few days ago, exhibited his oxy-hydrogen gas-light on the top of the Egremont hotel, to show its capability for the purpose of night-telegraphs. The light exhibited, though only one-sixth part those at the light-house, was little, if rior to them in brilliancy, and in w purity greatly superior. When at its liancy it threw a beautiful stream of the river.—*Liverpool Times.*

M. Arago. — Mr. Patteson (baillie has arrived in Paris, on purpose to p Arago the freedom of the city of Gl honourable distinction is a great mar and respect for the high character a discoveries of our illustrious country *rier Francais.*

Miniature Steam-Ship.—The Earl when at Glasgow, inspected, along friends, a miniature steam-vessel, George Foster, a tinsmith. It is 14 inches broad, and the length of 7 inches; cylinder 2¼ inches; strok The steam-engine was set to work, a the ship along the Clyde at the rate walking.

Manual Labour and Mental Cultiva conviction—not lightly taken up, but long and earnest thought—is, that d tion with manual labour is in no way ble with the highest mental cultivatio ment; that so far from the exercise of employment daily, for a moderate tim trimental to the mental powers, it has trary, a decided tendency to strengthe that, if those who at present serve t the capacity of writers were to em hours a-day in mechanical labour, health would be improved, and th would take a character of vigour start themselves. They would find the more healthy atmosphere than the dr There is no reason, save ignorance, w like degradation should attach to the the working mechanics. There is no ignorance, why they should not have good as their employers, as to all th comfort. There is no reason, save ign they should not have refreshing bath daily toil, and abundant change of ments conducive to health. There i save ignorance, why they should not dance of good and well-prepared food and access to books of all kinds fo culture of the mind. There is no ignorance, why they should not hav theatres, and operas, and lectures of a picture and sculpture galleries, and more imposing than any thing the w beheld. There is no reason, save ign the great body of the working peopl possess, in addition to all that is nece comfortable maintenance of the b pleasures of mental refinement, wh only within the grasp of the very ri no reason, save ignorance, why the of the State should not be in their and all else, save only the exciteme tation and expensive sensuality."—*T*

Communications received from Mr. Wm. Pearson—Enort—A Constant R derland) — Myself — H. W. — T. B. K. M. K.—J. B.—Carlos—Mr. Saul— B. C. T.

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No. 590. SATURDAY, NOVEMBER 29, 1834. Price 3d.

APPARATUS FOR SHOWING THE CAUSES OF THE SEASONS.

Fig. 1.

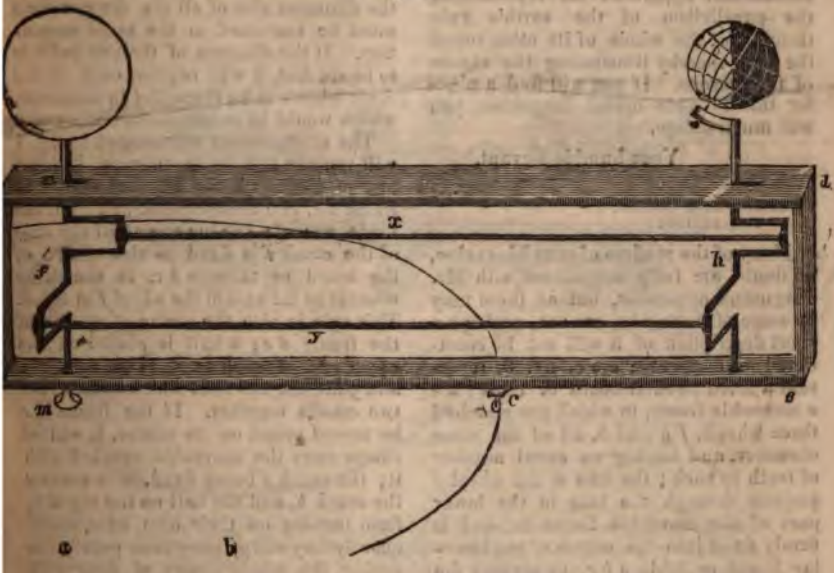
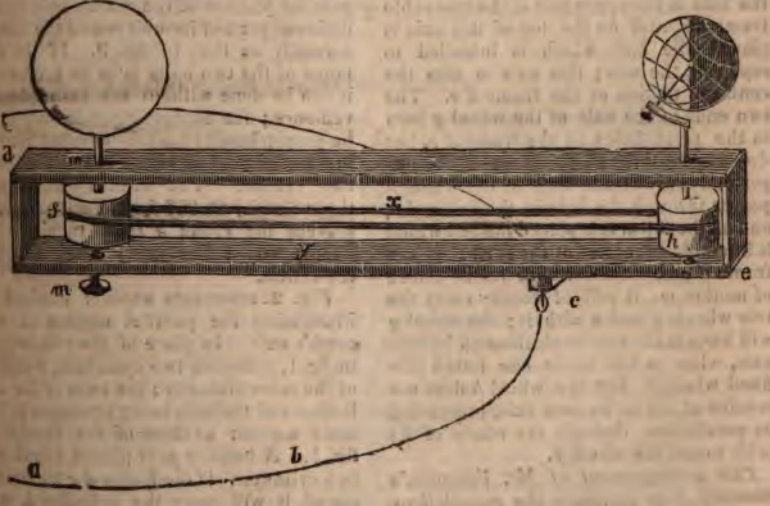


Fig. 2.



IMPROVEMENT IN FERGUSON'S APPARATUS FOR REPRESENTING THE PARALLELISM OF THE EARTH'S AXIS.

Sir,—I beg leave to suggest, through the medium of your valuable Journal, a small improvement in Mr. Ferguson's mechanical apparatus for representing the parallelism of the earth's axis, throughout the whole of its orbit round the sun, thereby illustrating the causes of the seasons. If you will find a place for this in your useful Magazine, you will much oblige,

Your humble servant,

J. R. ARIS.

Sun Fire-office, Cornhill,
Aug. 11, 1834.

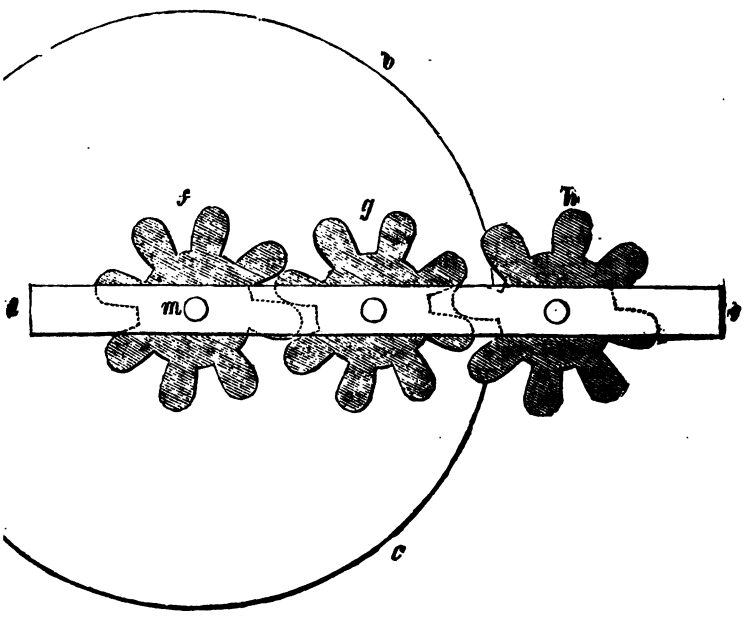
Many of the readers of your Magazine, no doubt, are fully acquainted with Mr. Ferguson's apparatus, but as there may be some of them who are not, perhaps a short description of it will not be considered unnecessary: *a b c*, fig. 3, represent a fixed circular board or table; *d e* a moveable frame, to which are attached three wheels, *f g* and *h*, all of the same diameter, and having an equal number of teeth in each; the axis of the wheel *f* projects through the hole in the lower part of the moveable frame *d e*, and is firmly fixed into the centre of the circular board or table *a b c*, to prevent the wheel from having any motion whatever; and the other end of the axis passes through the hole in the upper part of the moveable frame *d e*, and on the top of this axis is placed the ball which is intended to represent the sun; this axis is also the centre of motion of the frame *d e*. The two ends of the axis of the wheel *g* turn in the pivot holes in the frame *d e*, but do not pass through them; and the upper end only of the axis of the wheel *h* passes through the hole in the frame *d e*, and on the top of it is placed the ball which is intended to represent the earth. If the frame *d e* be turned round on its centre of motion *m*, it will of course carry the two wheels *g* and *h* with it; the wheel *g* will have made two revolutions on its own axis, when it has made one round the fixed wheel *f*; but the wheel *h* does not revolve at all on its own axis, preserving its parallelism through the whole of its orbit round the wheel *f*.

This arrangement of Mr. Ferguson's *represents very correctly* the parallelism of the earth's axis in the different parts of its orbit round the sun; but there is an inconvenience attending this arrangement, that is, if the apparatus be required to be on a larger scale, by increasing the distance between the two balls, which represent the sun and the earth, the diameter also of all the three wheels must be increased in the same proportion. If the distance of the two balls is to be six feet, it will require each of the three wheels to be three feet in diameter, which would be rather incommodious.

The arrangement represented in fig. 1 will remedy this inconvenience. Instead of the three wheels in the moveable frame *d e*, two double cranks, *f* and *h*, are made use of; the lower end of the axis of the crank *f* is fixed to the centre of the board or table *a b c*, in the same manner as the axis of the wheel *f* in fig. 3. This axis is also the centre of motion of the frame *d e*; a ball is placed on the upper end of each axis, as in fig. 3; *x* and *y* are the two rods which connect the two cranks together. If the frame *d e* be moved round on its centre, it will of course carry the moveable crank *h* with it; the crank *f* being fixed, will prevent the crank *h*, and the ball on the top of it, from turning on their own axes, consequently they will preserve their parallelism during the whole course of their orbit round the axis of the fixed crank *f*. This arrangement will thereby represent the parallel position of the earth's axis in the different parts of its orbit round the sun as correctly as that in fig. 3. If the distance of the two balls is to be increased, it can be done without the same inconvenience; the connecting-rods only need be proportionally longer, without requiring any alteration whatever in size of the two cranks. The cranks have two throws each, at 90° from each other, to prevent the crank *h* from turning the wrong way immediately after passing the centre.

Fig. 2 represents another method of illustrating the parallel motion of the earth's axis. In place of the two cranks in fig. 1, there are two cylinders, *f* and *h*, of the same diameter; the axes of the cylinders and the balls being arranged in the same manner as those of the cranks in fig. 1. A band, *x y*, is placed round the two cylinders. If the frame *d e* be moved round, it will carry the cylinder *h* with

Fig. 3.



h will not revolve on its own serving its parallelism similar to k h in fig. 1. This arrangement to error, if there should be any e in the diameter of the two cy- or in the different parts of the nich, in the course of many revolutions, would accumulate; but this can be prevented, by substituting a chain for the band, and placing an equal number of spikes on the circumference of each cylinder, to pass into the links of the chain.

J. R. A.

MATHEMATICS AND MATHEMATICIANS.

I find that since you kindly in- ly last communication in your irculated Magazine, an able cor- nt, Mr. Exley, has written a pithy article in defence of ma- s and mathematicians. "Who," E., "was more practical than '—his optics present a model for ical men." Following out the n of thought, I would observe, himedes—who was by far the mathematician of antiquity— father of practical science. e have been more practical had less of mathematics? Sir C. he friend of Newton, was a profound mathematician: would he have been a greater architect had he known less of mathematics? Again, in all the military schools in Europe, designed for the education of cadets, is it not the universal practice to put those young gentlemen who have mostly distinguished themselves by their mathematical attainments into the corps of engineers, and those of the second order into the artillery, while all the dunces are turned to the right about face? Now, according to Mr. C.'s notions of "the eternal fitness of things," the very reverse of all this ought to be the case.

In p. 267, vol. xxi., Mr. Cheverton

I that the great Dr. E. Halley, in 1684, turned his attention to the famous problem of tried to derive *it from a graduating* central force, but was unable to give a geometrical *on of it; he then applied for help* to Dr. Hooke (said to have been the inventor of *Sir C. Wren, and it was then he* became acquainted with the great discoveries of Newton. *resent King's architect, fortunately, is* no mathematician. Buckingham-palace proves the fact.

quotes a passage from the writings of Professor Sedgwick. "To suppose" (says the Professor) "that we can reason up to a first cause on moral questions," &c. No one can be so ignorant as to suppose that this passage was ever meant to apply to mathematicians, although Mr. C. would wish it to do so (*any port in a storm*). But availing himself of this inapplicable remark, he deduces from it this most questionable corollary: "The mere mathematician is disqualified by his *prejudices, his habits, and the tutored bias of his mind*, to look at the world of nature as it is." "For however paradoxical it may appear, views may be taken of it, which, although less exact than his, may be more complete, and *though less certain, may be more probable*." That is, in plain English, of two events there may be less certainty of the first happening than the second; still the probability may be more in favour of the first event taking place than the second! Shade of De Moivre, listen to this!

"*The tendency of mathematical studies to unfit the mathematician for the general study of nature, and for investigation into the complex structure of human affairs, has now been stated.*"

Yes; Mr. C. has given his own statement of the question, though he has thrown preciously little light upon it. We can gather this fact only from his statement, that the *general study of nature*, and what is commonly called the study of natural philosophy, are two sciences, in complete opposition to one another. For, according to Mr. C.'s statement, mathematics completely unfits one for making any progress in the study of the first; while a knowledge of mathematics is held to be absolutely necessary for the purpose of obtaining a knowledge of the second. Well, I shall advise Mr. C., if ever he should take it into his head to give lectures on the *General Study of Nature*, to print in large letters on the outside of his lecture-room—"*Let no one acquainted with mathematics enter here.*" The system might very appropriately be named the Anti-Pythagorean. Along with the general study of nature, Mr. C. has associated the investigation of the *complex structure of human affairs*. What kind of new algebra is required for unravelling these complex investigations, Mr. C. does not inform us. I hope, however, it will not turn out to be of such a complicated nature as the *manageable equations* of the Eulers Bernoullis.

Mr. C., in order to enforce the of his own statements, quotes the fo ing passage from the writings o Chalmers:—"In almost all the inst of mental superiority, it will be that it is a superiority above the av level of the species in but one thi that arises from the predominance faculty above all the rest." In thi Dr. Chalmers, in the most distant d insinuate that a knowledge of mat tics unfits one for any of the co duties of life? Certainly not. But the deduction which Mr. C. wis draw from it. "We may exten remark," says Mr. C., "and say nature is seldom perfect in opposi rections in the same individual, an if her bounty flows strongly in an ticular channel, it is generally a expense of the diverging stream. is so strong in the case of the mat tician, &c." Now the events of Dr. mers' own life completely disprov inferences which Mr. C. wishes to from the quotation; for Dr. Chal himself a very able (perhaps I ou say a profound) mathematician, an of the very few, (Mr. C. states, are not above a dozen; see No. 5 360,) who in Britain have studie "Mechanique Celeste" of La Place C., in the early part of the present ce was himself assistant Professor o thematics in the University of St drew's,* and it is well known how and assiduously he performed his The height of his ambition was t ceed to the mathematical chair; b fortunately for science, political in was found to be an over-match f perior mathematical attainments. that period, the brilliant career o C. is well known; so that in Dr. mers' case, we find him first a teac mathematics; second, a minister o Gospel; third, a professor of mora losophy; and fourth, a professor o vinity; to which may be added author and orator of the first order.

But perhaps, Mr. Editor, I d rightly understand to the full e what Mr. C. means by the *complex ture of human affairs* (albeit, my

* About the same time the writer of thi for a considerable time near St. Andrew's.

much crammed with mathematical
But, by way of exemplification,
conceive that the complex ma-
y of British commerce forms one
sections. Does mathematics unfit
or acting a prominent part in that
ame of speculation? Make them
ble to calculate the chances in
an affairs" with shrewdness and
on? Certainly not. All the great
ercial offices in London have their
tants and actuaries, (and mathe-
ans they must be, more particu-
ie actuaries,) and it is well known
ost of these gentlemen are able
naticians. Some of them have
rst wranglers at Cambridge; others
d the honours of your most learned
es to their names: some have
l at the famous Polytechnic school;*
have been authors in almost every
ment of mathematical and physi-
ence, and not a few of them have
and still continue to be, contribu-
the various periodical publications
d to scientific pursuits. Such are
en, Mr. Editor, that scientifically
the movements of the most com-
arts of the machinery of the higher
of commercial speculations.
a lower scale of mercantile emi-
great talents are certainly not
ed; common sense, honest indus-
id a tolerable knowledge of com-
rithmetic, and a few of the precepts
nklin's "Poor Richard," are suf-
for the purpose. But we often
at some men who never possessed
ch intellectual knowledge as would
out-shell, have from small begin-
contrived to amass great wealth;
nine cases in ten it will be found
ost of their wealth has been ac-
by fraud. In their hearts the
leity they worship (although out-
they pretend to be very religious)
god of wealth; and the only maxim
hink of is, "man mind thyself."
conscience, if they should happen
e any, (like the soul of the licenti-
dro Garcias,) is securely locked up
r money-bags. In short, the props
r system form a medley of cheat-

ing, lying, hypocrisy, and dissimulation. Among such a crew I certainly allow that a mathematician is perfectly unfitted to act a part (truth being his shield), for the reasons which Mr. Cheverton has so forcibly assigned; viz. "his *prejudices*, his *habits*, and the *tutored bias* (thank you, Mr. C.) of his mind."

Mr. Cheverton talks about the abuses of mathematics, &c. No doubt the greatest mathematician may at times fall into an error; but the principal abuses are produced by ignorant pretenders (a little learning is a dangerous thing); some of them, before they can solve a simple question (to say nothing of geometry), wish to pass themselves off as first-rate mathematicians. What can be expected from such persons (when they have the arrogance to expose themselves), but nonsense? We sometimes see a display of this in the Mechanics' Magazine (seldom, I admit). A certain gentleman not a year ago got himself so entangled and bewildered in the toils of a certain pneumatical question, that in order to wriggle himself out, he was obliged to deny the truth of a certain proposition in Euclid. Another gentleman has calculated that a circle of seven miles radius would, in 1834, hold all the people that do exist, together with all those that have existed since the creation of the world; and that all the deaths that have taken place since the formation of this world amount to only about 3¾ times the number now living. Any sensible child of 12 years of age would laugh at such nonsense. Algebra is a powerful agent in the hands of an experienced analyst, but it is worse than useless in the hands of an ignorant pretender. As the Scotch proverb says, "Fules shouldna hae chapping-sticks."

About eight months ago a geometrical problem was proposed in the Mechanics' Magazine by Agricola, afterwards corrected by the scientific Iver Maciver, and solved by a *lady*, (No. 558). Mr. C. sneers both at the problem and at the solution which the lady gave of it (although it was far from being an easy one). In this Mr. C. has shown a very bad taste (leaving out of the question his want of gallantry). For although he himself may have very good reasons for neither proposing nor solving mathematical questions, he ought not to speak lightly of those who have a turn and a

. C. speaks very contemptuously of this
ed school (see p. 270, vol. xxi.). Professor
Leslie, on the contrary, says, "The Poly-
School, in a short period, has drawn together,
into rapid motion, a far greater mass of
atical and *physical talent*, than any of the
minaries in Europe."

capacity that ay. He has surely heard of the two Delian problems, which called forth all the powers of the ancient analysis, and led to the discovery of the conic sections, and of other curves of a higher order, and ultimately paved the way for the great discoveries of Galileo, Kepler, and Newton.

I observe in the *Ladies' Diary* of last year, that one of the mathematical contributors had unwittingly spoken lightly of a certain diophantine question, and he is thus justly reproved by the editor (Dr. Olinthus Gregory): "We beg (says Dr. Gregory) to remind this gentleman, that a department of mathematics, ardently cultivated by such illustrious men as *Euler* and *Gauss*, ought not to be lightly spoken of." "It may be the fortune of our correspondent to associate with those who unduly exalt one department of science, and as unjustly proscribe every other; but it has been the constant object of the conductors of the *Ladies' Diary*, now for more than a century, to aim at the cultivation and improvement of *every region* of mathematical knowledge." This, we doubt not, has given to this unpretending publication its great pre-eminence, while it has made it constantly useful to mathematical students."—(Ladies' Diary, 1833, p. 39.)

Mr. C. informs us (p. 269), that the celebrated engineers, *Smeaton*, *Watt*, *Rennie*, and *Telford*, were never distinguished for their mathematical acquirements, "beyond the meanest common place." With regard to Smeaton, Rennie, and Telford, I cannot at present state any thing positively to the contrary (although I think he is mistaken, and more particularly so with regard to Rennie); but with regard to Watt he is certainly wrong, for it is well known that Mr. James Watt possessed the highest capacity and inclination for the mathematical and physical sciences, and no one ever had a better opportunity of improving himself in these sciences. It is also a well-known fact, that about the time he left the University of Glasgow, so far as mathematics and natural philosophy were concerned, he was fully qualified for a chair in either department; and had his ambition taken that direction, might have attained to one. In short, Mr. Watt, from being an able mathematician, became one of the greatest *and most useful* engineers that Britain (or perhaps any other country) e duced.

But, Mr. Editor, I must have upon your pages, and for the subscribe myself,

Yours, with respe

LEWIS

Antwerp, Oct. 29, 1834.

KYAN'S CURE FOR DRY ROT NOT

Sir,—In your highly useful Jour 583, there is an article headed " GRAPHY NOT NEW." In the fo number there is another article " *Mr. Kyan's Cure for the Dry* to which you might have added, with equal propriety—NOT NEW. induced to trouble you with this in consequence of reading th spondence in the latter number, and 46—being a little doubtful a Kyan's claim to what he is pl call " *his* process for preserving from dry-rot, or decomposition." same time I do not pretend to kn thing either of the merits or de the plan itself; or how far its a may be " prejudicial to the healt officers and crews of his Majesty' or otherwise: all I wish to state the application of corrosive sublim the purpose in question, appears been known, and its "efficacy" und probably five-and-twenty years a about that time that great phil and chemist, the late Sir Hu Davy, proposed (see article *Dry* the supplement to the " Encyc Britannica," vol. iii. p. 683)—" solution of corrosive sublimate most efficient preventive, in p timber for ship-building, & am not sure whether the Gov has at any time since taken a towards carrying this recomme either partially or generally, into The *fact*, however, is clear, subject extremely interesting to lic: the question now being as t the *discovery* really belongs—wh Sir Humphrey Davy or Mr. Perhaps the latter gentleman w the goodness to offer a few word planation.

I am, Sir,

Yours, &c

K.

Nov. 21, 1834.

ANOTHER CURE FOR DRY ROT.

Sir,—Having perused several letters in your valuable Magazine, No. 584, respecting "Dry-rot," in some of which great importance appears to be attached to Mr. Kyan's method of curing this destructive process, by using "corrosive sublimate," I beg leave to submit a few remarks upon this important subject. Some years since I used a great quantity of corrosive sublimate to preserve bird and animal skins from moths and other insects, but found it so very far from answering the purpose, that of late I have taken to my old process of using what naturalists term arsenical soap (the recipe of which I have by me), which I find infinitely superior. Now it appears to me that arsenical soap might be very judiciously employed to the permanent preservation of wood, at one-tenth of the expense of Mr. Kyan's process, and without any danger to the health of a ship's crew—that is, should there be any ground for Mr. Murray's fears. When I used corrosive sublimate, I found it affect my health very much, but do not find any inconvenience arising from the use of arsenical soap.

I remain,
Your obedient servant,
H. W.

Woolwich, Nov. 10, 1834.

PROOFS THAT FLAME IS HOLLOW.

Sir,—The accompanying are submitted as illustrative proofs of the hollowness of flame, as they show, in a very evident manner, that such really is the fact.

Fig. 1.

Fig. 1 is *the shadow of a burning* lamp thrown upon white paper by the reflected rays of the sun, the direct rays being usually too strong for the purpose. The shadow marks in a very distinct manner the extent of the flame all around, and shows the transparency occasioned by its hollowness; in this experiment the ascending columns of heated air and smoke are also shown in a very pleasing and satisfactory manner.

Fig. 2.

Fig. 2 is a piece of perforated paper, which has been used to resist the passage of flame in the experiment described in the Mech. Mag. vol. xxi. p. 328. The paper has been removed immediately on the commencement of the scorching process, the mark made by which delineates very prettily the action of the ring of flame which surrounds the wick of the lamp, while the centre of the paper remains untouched.

Some persons may attach less importance than I do myself to these modes of proving that flame is hollow, but I think they exhibit in a tangible and novel manner some of the facts already so ably and fully explained by Mr. Rutter, and other of your talented correspondents.

I remain, Sir,

Yours respectfully,

WM. BADDELEY.

London, Sept. 18, 1834.

THE ALMANACS FOR 1835.

We have been accused by several correspondents (not very disinterested ones we suspect) of evincing a spirit of hostility to cheap literature, because in the brief notice which we took a few weeks back (No. 585, p. 64), of the multitude of cheap almanacs with which the book-market was inundated immediately after the repeal of the stamp duty on almanacs, we denounced them in the mass as a disgrace to the British press. We shall plead guilty to the charge whenever a single cheap almanac for 1835 can be shown to us published previously to the date of our notice, which is not worse than useless from its numerous inaccuracies and blunders. We shall own, too, that it is a palpable proof of our unfriendliness to cheap literature, that we have denounced the ephemeral swarm alluded to, whenever it can be shown that the interests of literature of any class are likely to be promoted by the success of ignorance and imposture. The notice of these self-styled "cheap" almanacs being identified (with cheap literature is in truth supremely ridiculous. How can that be cheap, which taking its quality into account, is dear at any price? How can that help to promote cheapness which is calculated to bring all cheapness into suspicion, as but another term for exceeding worthlessness? Cheap bread is at least as desirable a thing as cheap knowledge; but the baker who, freed from the control of an assize, should expect to be thanked and applauded for making bread cheap by adulterating it—by using, for example, damaged flour, mixing that damaged flour with pounded chalk, and then seasoning the atrocious compound with a *quant. suff.* of jalap or vitriol, would be counted fool as well as rogue. Now, your cheap almanac-maker (of the class to whom our notice had reference) is a person of precisely the same kidney. He is one who pretends to be enabled, by a certain beneficial change in the law, to furnish for a penny or twopence, or sixpence, as good an article as people have been heretofore in use to pay two shillings and threepence for: while, in point of fact, he has only taken advantage of the change, to palm on the public a spurious imitation of the article, of no value whatever. He is one who *seeks credit for computations never computed (which he* has not even the decency to take the necessary time to compute)—who does by guesswork what requires some of the best head-work in the country to do rightly—who boasts for his entire stock-in-trade some half-a-dozen of old almanacs, a pair of scissors, and a bowl of paste—a regular "duffer;" in short, who, under pretence of helping you to a most extraordinary bargain, very deliberately picks your pocket.*

Approving, as we do, most unreservedly, of the abolition of the duty on almanacs—considering it as one important step towards that entire abolition of the taxes on knowledge, which we hope ere long to witness—we have felt not a little indignant at seeing the beneficial operation of the measure marred by such mercenary interlopers as this; the more so, that they have had the singular good fortune (such is the frequent success of audacity) to pass unscathed through the critical ordeal of nearly all the rest of the weekly and daily press. By none of our contemporaries has the thorough hollowness of their pretensions been seen through, or at least exposed; some have even praised them highly! Perhaps they never deemed them worth a serious thought; their critical acumen may have been exhausted in expatiating on the merits of that higher order of annuals, whose gaudy attire and interior splendour are the pride of drawing-rooms and boudoirs; and to such humble labourers in the vineyard as ourselves, it may have been left to look after that minor class which aspire only to furnish useful helps to the active business of life.

The talent required for the mere calendarial part of an almanac is not great: all that is requisite is to apply correctly the clear rules laid down in Lord Macclesfield's Act, for the reformation of the style in England; and to do this needs but ordinary pains and attention. So careless of accuracy, however, have the getters-up of these dear "cheap" almanacs been (got up like the razors in the story—not for use, but for sale), that there is not one of them which is not in the calendarial part grossly erroneous. In

* A distinction must sometimes be made between the getters-up of these things and the publishers. Among the latter there are some respectable persons, who would not, we are persuaded, be knowingly parties to such quackery as is decribed in the text; they must have been themselves imposed upon.

the most showy of the class, styled *ople's Almanac*, Easter Term is o end before its time, and Trinity o end twice—May 28th, and June neither of them the right date; tival of St. Barnabas is assigned 12th, instead of the 11th of June; eral important festival-days, such Lady Day, Old St. Martin, &c., olly omitted. In the *British d Almanac* (by the same hand ap- y as the *People's*) the same errors . In the *British Calendar and ac*, an Ember Week is placed in where there is none; a wrong ter- n is given to the Cambridge Hilary the anniversary of St. John Port. (6th May), is changed into the sary of St. John the Evangelist; inity Term is made to begin and ay sooner than it should do. In *ll's Penny Almanac*, the second *after*, is said to be the second *in* Epiphany; the first *Sunday* in made to fall on a *Saturday*; Easter Term is shortened by five days, and Trinity Term lengthened by as many! And so it is with all the others; every one abounds, more or less, in blunders of the same inexcusable sort.

But it is in the astronomical portion of these almanacs that the reckless incapacity of their concocters shines forth most conspicuously. What is to be thought of an astronomical computer who makes the moon to *set* not only before it comes to *the south*, but actually an hour and more before it can possibly *rise*—and this not once, but several times in the course of the year? Or, of his representing the moon as *setting* when it is in fact *rising*; and then making all the risings and settings of the moon throughout the year to correspond with this egregious blunder? Is not such a batch of specimens as the following enough to make even the bungler himself blush? We select them from the *People's* and *Diamond* Almanacs:—

15 moon is said to *set* "8 a 38," *i. e.* 4 hours 16 minutes *before* it comes to the meridian.
29 moon is said to *rise* "7 — 44," *i. e.* 5 hours 53 minutes *after* it has set.

14 moon is said to *set*	"8 — 8,"	when in fact it *rises*	"6 a 33."	
15	ditto	"8 — 40,"	ditto	"7 — 57."
16	ditto	"9 — 8,"	ditto	"9 — 20."
17	ditto	"9 — 31,"	ditto	"10— 45."

same very correct computer is to inform his readers that the omet, called after Halley, was ally seen" by him, though, ac- to every body else who has writ- it it, it was seen *twice*, at inter- about 75½ years, before Halley rn. He is able, moreover, to day, when this comet will return art. "It is to re-appear in the hemisphere on the 9th of Aug., ain visible until the 7th of Feb., that is, according to another r of the same stamp, the doer of ny for *Marshall's Penny Alma-* s "to remain visible *exactly* six " Now the utmost that the Her- and Airys, and Ponds, and So- s, and other first-rate astronomers ay, have been able, with all the of the most refined analysis at mand, to predicate of this erratic , is, that if it has not by this n extinguished, or been diverted original course by some inter- influence—both of which are pos- ents—it will, *most probably*, *some time in August next* and disappear *some time in October*. *They* can specify no particular day for its appearance or disappearance; neither is it with them expected to remain visible for more than *two* months. And if *they* can venture no further, need we hesitate to conclude that the "*exactly six months*" of Messrs. Penny Almanac and Co. is a prodigious bounce?

The *British Calendar* is not so nonsensical about the comet as others of its class, but it has made ample amends to the genius of quackery under the head of eclipses. Here we are favoured with a very pretty engraved representation of the partial eclipse of the moon, which is to take place on the 10th of June, 1835; but, unfortunately for its pretensions to accuracy, we cannot perceive the slightest difference between it and an engraving which appeared in Pinnock's Guide to Knowledge for Dec. 1833, of an eclipse of the moon, which was visible about that time. They are, in fact, one and the same. The serving up of an eclipse, *good as new*, was all that was wanting to exhibit in its proper colours the system of imposture and trickery which has been pursued in

the getting up of these mock-almanacs; and with that, therefore, we take our leave of them.

It is now, indeed, high time that we should turn our attention to the many *really cheap* and valuable productions of the Almanac class, which the season has in *due season* produced. Among them we are glad to recognise all our old friends and favourites—even though some of them have got new faces; nor are we sorry to perceive several entirely new candidates for public favour.

First in our "dear love," there is our renowned, never dying, and (we hope) never to die, friend and "physician," Francis Moore, who, with all his old-fashioned nonsense about "the dominion of the moon in man's body," and the "influx and influences of the planetary orbs with respect to the affairs of the world," is still *very* dear to us, for the ardent devotion which he continues to display to all the best interests of humanity, for his constant denunciations of craft, tyranny, and oppression, and his unceasing prayers for the welfare of "the people;" for the never-erring exactness of his calendarial calculations, and the still unrivalled fulness, accuracy, and popular intelligibility of his astronomical observations. We can well excuse the old man his "hieroglyphics," for the sake of the salutary influence which the general cast of his "vox stellarum" is calculated to exercise on the public mind of the country. All the harm that he can ever posssibly do by encouraging a belief in astrology, will never outweigh a tenth of the good he is sure to do, by the excellent "materials for thought," which he annually supplies to the minds of the great bulk of the British people. What, for instance, could be in a finer vein than the conclusion to his "astrological predictions" for the coming year—

"And where is the nation of which it is said, 'Oh my people, they that *lead* thee *cause thee to err*, and destroy the way of thy paths.' Let each and all look well to their principles of action, for the scenes of the moral drama are every where thickening, and rapidly changing. A week will bring forth as many events as used often to occur in a year; the proud will be humbled, dishonesty exposed, hypocrites will lose their masks, and lick the dust, while the true patriot, looking steadily *at the distant horizon, will* exclaim, light is breaking forth from under the cloud—REJOICE, REJOICE!"

What harm, though every one who reads this prediction were to believe every word of it?

Partridge comes, we believe, next in point of antiquity. It is, as our readers are aware, very similar in all respects to Moore—in fact, only second to it. The people do not put that faith in Partridge which they do in Moore; but when they come to compare what he has predicted of the present month of 1834, with the actual events of the last fortnight, they may possibly begin to entertain a higher opinion of his sagacity. It almost seems as if the prediction were written after the events; it is in the following by no means ambiguous terms:—

"The counsels of nations at a stand about some public affairs, and this attended with the removes of some great men, either by death or displeasure, and strange reports of others in the mismanagement of some important matters intrusted to their care. Do not be deceived by demagogues and pretenders!"

Among the new matter in the Partridge for 1835, there are the following very useful directions for ascertaining the magnifying power of a telescope:—

"At the distance of one or two hundred yards from the telescope put up a small circle of paper, of any determined diameter, an inch for instance, upon a card or any piece of strong paper, through which the light cannot be easily transmitted; draw two blank parallel lines, whose distance from each other is exactly equal to the diameter of the small circle; adjust the telescope to distinct vision, and through it view the aforesaid small circle with one eye, and with the other eye open also, view at the same time the two parallel lines. Let the parallel lines be then moved nearer to, or further from, your eye, till you see them appear exactly to cover the small circle viewed in the telescope; next measure the distance of the small circle, and also of the parallel lines from your eye; divide then the distance of the former by that of the latter, and you will have the magnifying power of the telescope required."

The *Ladies'* and *Gentlemen's Diaries* are among the old friends to whom we alluded, as appearing with "new faces." The beneficial operation of the recent repeal of the stamp duty is more observable in them than any other of the Stationers' Company's almanacs. They

now contain each an additional sheet, in the form of an appendix, filled with original contributions to mathematical science, are stitched up in handsome covers, and published at less than one-half their former price. These supplementary sheets are to be regularly continued, and will no doubt, as anticipated by the Editor, "form, in a very few years, a rich repository of instruction for mathematical students."

The present appendix to the *Ladies'* contains—1. "Horæ Geometricæ," by T. S. Davies, Esq., F.R.S., Royal Military Academy; the first of a series of papers in which this able mathematician proposes to exhibit a connected series of the properties of geometrical figures—2. "Synopsis of Spherical Geometry," also by Mr. Davies; in which he presents the results of some very curious and original investigations which he has made into the principles of spherical co-ordinates—3. "Remarks on the Determination of the Position of the Strata, or Stratified Rocks," by L. A. Necker (from the Edinburgh Transactions)—4. "Demonstration of M. Alfred Gautier's Formula, for determining the Positions of Strata," by Mr. Davies; and 5. Results of the late Captain H. Foster's Pendulum Experiments, abstracted from the Report on these Experiments lately drawn up by Mr. F. Baily, and printed at the expense of the Board of Admiralty. From the conclusion of this last article, it would seem, that after all the immense labour which has been bestowed on pendulum experiments, in all parts of the globe, during the present century, there are difficulties in the way, which make it doubtful whether the true figure of the earth will ever be obtained by this means. Mr. Baily observes—

"On a review of the whole, I think it must be conceded that the differences between the observed and the computed values in many cases, far exceed the probable errors of observation; and being in several instances confirmed either by the experiments of various persons, or by various pendulums swung by the same person, show most clearly that there is some local influence on the pendulum at such stations, with the exact nature of which we are at present unacquainted, and which baffles all our efforts to deduce the true figure of the earth from pendulum experiments made at a few places only."

The Appendix to the *Gentleman's* Diary is entirely occupied with one long but able article, by Mr. W. S. B. Woolhouse, "On the Fundamental Principles of the Differential and Integral Calculus, and the Reasonings employed in their Application." It is introduced by some very sensible observations on the sources of the prejudice with which this branch of mathematical study is but too generally regarded. We must extract the following:—

"It is to be regretted that most of our academical treatises on this as well as other subjects, abound so much with complex algebraical processes, without the slightest traces of logical reasoning to exercise and improve the intellect; we should bear in mind that the simple execution of analytical operations, acquired by dint of practice and experience, *is a mere common species of labour*, often merely mechanical; whilst a distinct apprehension of the specific object and meaning of the operations, and a contemplation of the clearness and beauty of the various arguments employed, constitute the intellectual lore that gratifies and enriches the mind, and stimulates its energies with an ardour after the investigation of truth."

Mr. Woolhouse in his paper has pursued a different course; he has made it his study to present the fundamental principles of the differential and integral calculus in as intelligible and popular a form as possible, and has succeeded to a degree which we scarcely imagined within the limits of attainment.

It will perhaps be remembered by our readers, that it was last year announced that the portion of the *Gentleman's* usually occupied with enigmatology would in future be devoted to scientific notices. We welcomed the change, and have now to congratulate the subscribers to this annual on the result. Instead of some score of pages filled with unprofitable (however amusing) rebuses and charades, they have now an extremely well-selected collection of notices of the more remarkable additions made to the treasures of science during the past year.

White's Ephemeris seemed to offer but little room for improvement, but improved it has been in no ordinary degree. The right ascensions of the planets are now given for each day, at noon, correct to *seconds* of time. The *hours* of right ascension are given at the top of each respective column, and again as often as

the hour changes; the minutes and seconds for each day follow in succession. The utility of such an amplification of the tables was pointed out in this journal some time ago by our ingenious correspondent, Mr. Woollgar. It has been also resolved to attach in future to this Ephemeris an annual appendix, similar to those of the *Lady's* and *Gentleman's* Diaries, "consisting of such tables, rules, investigations, or other matters connected with the theory or practice of astronomy, as may be best calculated to be useful to persons who are devoted to astronomical and nautical inquiries or operations." The appendix to the present number contains A Table to abridge the computation of the longitude and latitude; the right ascension or declination being given, or the contrary, by J. C. Burckhardt—A new method of reducing the apparent distance of the moon from a star to a true distance, by Baron Zach; and a Paper on the Geographical Latitude and Longitude of a Place on the Terrestrial Spheroid, the goedesic distances of which from the meridian and perpendicular of a given point are known: with two auxiliary tables; by the same.

On the cover of White's there is a notice by its avowed editor, Dr. Olinthus Gregory, in which he gives the following explanation of the extent of his connexion with this and the other similar publications of the Stationers' Company; an explanation not given before it was needed, as all will allow who have read the reports given in the newspapers (in much that regards Dr. Gregory very erroneous) of certain recent proceedings in the Court of Chancery, on the application of the Stationers' Company for an injunction against the publishers of a spurious imitation of Moore's Almanac:—

"He holds himself entirely responsible for what may appear in this EPHEMERIS and in the LADY'S DIARY, whether original or selected. His responsibility also extends to the *astronomical department* of nearly all the almanacs published by the Company; and they have, for several years, done him the honour to consult him as their general *scientific adviser* upon all points of importance, with regard to the gradual modification and constant improvement of such almanacs as the public continue to receive favourably, and to the occasional introduction of new almanacs to meet the wishes or the exigencies *of any class of readers.*"

Some bibliographical particulars are added respecting White's Ephemeris, which are interesting enough to deserve quotation:—

"This Ephemeris, first projected in 1749 by an able mathematician, *Mr. Robert White*, of Grantham, was, after his death, conducted, with very slight deviations from the original plan, successively, by *Mr. E. Rollinson*, and *Dr. Hutton*; by the latter of whom it was, about twenty years ago, with the concurrent wish of the Company of Stationers, consigned to the charge of the present editor. During the period it has been under his charge, he has introduced, from time to time, such beneficial additions as were consistent with its size and price; and among these, the places of the four new planets, which were thus given long before they found their way into the *Nautical Almanac*, among those admirable improvements, which now make it the honour of Britain, and a beautiful specimen of what the talents and science of Englishmen can accomplish."

The compliment paid, in the preceding extract, to the Nautical Almanac, as now conducted, is well merited, and does honour to Dr. Gregory's candour and impartiality.

Of those other almanacs published by the Stationers' Company—*Rider's Merlin*—*Moore's Improved*—the *Englishman's*—the *Tradesman's and Mechanics'*—the *Clergyman's*—and *Goldsmiths'*, we have but room to say, generally, that they sustain well the reputation which they have acquired, each in its particular line.

The Company have added to their list this year, three *new* almanacs—the *Family and Parochial*, designed to supply "the want of an annual compendium of useful information, particularly adapted to heads of families and parochial officers"—the *Medical*, intended as "a summary of useful information, not only to the medical profession, and to those who propose to enter it, but to the public in general, in reference to medical institutions"—and the *Evangelical*, the object of which is to concentrate "the various information (afloat) relating to Religious Societies, Missionary Stations, and Ecclesiastical Statistics." Each of these almanacs comprehends, in addition to the matter which confers upon it its peculiar character, "all the usual contents of an almanac." We think well of all three, and hope to see them continued. The

notice, in the *Family and Parochial*, of the approaching comet, is one of the most correct and reasonable which we have seen, and may be advantageously quoted, as a set off to the nonsense we have extracted on the subject from the dear "cheap" almanacs.

"*Dr. Halley's celebrated Comet*, of about 75½ years' period, will probably appear in the autumn of 1835. It is expected to be at its perihelion early in *November*, and to appear in the north-eastern horizon soon after midnight, the first week in *August*. Let it be borne in mind, however, that though there is a strong probability that this comet will appear next autumn, it is *only* a probability. The comet may appear earlier, later, or not at all. Most comets have so very little density, and are so light and filmy in their structure, that even the particles of this *may* be dissipated before the present time: and it is well known that its magnitude and brilliancy, as well as the length of its tail, have undergone successive diminutions in its several returns from 1305 to 1759. *If*, however, its matter be not dissipated, and if it have not been subjected to the perturbing force of some body unknown to us in the remoter regions of its orbit, it will doubtless appear about the time above specified. See *White's Ephemeris* for fuller information. The comet of 1532, and 1661, was expected to return in 1789, or 1790, agreeably to an announcement of *Dr. Maskelyne*, the then Astronomer Royal, in the Philosophical Transactions for 1786, and in most of the almanacs, British and Foreign; but it did not appear. The failure in such anticipated appearances simply proves how ignorant we still are of the nature of comets: it ought not to diminish confidence in any of the other discoveries of astronomers, which are daily increasing, to the benefit of navigation and of science generally."

The *British Almanac* (of the Society for the Diffusion of Useful Knowledge) for the approaching year, is certainly superior to most of its predecessors; but it is still in many important particulars extremely faulty. The editors, or superintending committee, or whoever may prepare this almanac, most pertinaciously adhere to some of the most stupid of their original fancies; while they unhesitatingly adopt the hints of others, without acknowledgment. Thus, they retain their fanciful table of the duration of moonlight, constituted principally of dots; and *they adopt a useful hint, from whom, do our readers think?* even from the two last years' almanacs of Moore and Partridge,—the poor despised astrologers—the expulsion of whom from the almanac-market, was the principal reason assigned by the Diffusion Society for originally publishing the British Almanac. At p. 27 of Francis Moore's last year's almanac, and p. 31 of Partridge's, is inserted "a table showing the time of the sun's rising and setting at the places specified, for the first and fifteenth days of every month." At the foot of the table is the following note:—

"The times of sun rising and setting in the calendar pages are for the latitude of London. Those in the above table are now given that the reader may know pretty nearly what allowances to make for the above specified places, as well as for others having nearly the same latitudes. Brighton, &c. lat. $50\frac{1}{2}^{0}$; Bangor, &c. lat. 53^{0}; Carlisle, &c. 55^{0}."

The table is simple in its construction, and intelligible in its use. The makers of the British Almanac, adopting this very idea, give at p. 6 and 7 an "auxiliary table for finding the time of sun rising and setting." Copying honest Francis almost to the words, they say "the time of sunrise and sunset in the British Almanac is adapted to the parallels of latitude in which London is situated;" and add, "the following table has been constructed to show the variations of time through the United Kingdom." The British Almanac table is applicable to *all* places, for latitudes varying by half degrees from lat. 50° 10′ to lat. 58°, and for the 1st, 11th, and 21st days of each month, while Moore and Partridge only gave them for the 1st and 15th. The tables, it must be admitted, are different in their character, but their object is the same. The British Almanac table is more extensive; but Moore and Partridge have the advantage in point of priority and perspicuity.

The Diffusion gentlemen have a very odd fancy about the Saints' days. More than sixty of them they will not insert in their proper places in the calendar pages, where every body naturally expects to find them, if they are given at all; but in a separate page (the 4th), where they insert them for the sake of telling the reader "they are not inserted in the Society's almanacs." This is amusing enough; they are inserted to show that

they are *not* inserted. The reason given for their being both omitted and inserted is incorrect. It is this: they "are not important to be known, because they do not regulate payments of rent, and do not form anniversaries of national observance." Indeed! How many *rent*-payers dread *old* St. Martin (Nov. 23)? And though *fairs* are not anniversaries of *national* observance, they are observed by hundreds, in some cases thousands, of persons in those country districts where they respectively occur. Now there are more than 12 fairs that are regulated by *Perpetua*, 5 or 6 by *Boniface*, nearly 30 by *Margaret* and *Magdalen*, more than 50 by *old* St. Bartholomew, more than 50 which fall on *Holy Cross* and *Old* Holy Cross, 20, at least, on *Edward the Confessor*; and so on with regard to many other days that are inserted in the Society's expurgatory index. Yet these days are "not important to be known!" It also happens, that the *Ember days* (which regulate the ordination of clergymen) in September, are the Wednesday, Friday, and Saturday after *Holy Cross*; and those in December, the Wednesday, Friday, and Saturday after *Lucy*. Alas! for the Society's rules of proscription.

The article of "astronomical phenomena," on the left-hand page of each month in the calendar, is *a little*, and *but* a little, improved. But the editors retain their old whimsy about the constellations on the meridian. The constellations, *Serpens*, Libra, and Lupus, will be on the meridian "*about* midnight," and so on. We exposed this folly a year ago, at p. 152 of our 20th vol., and indeed in Nov. 1832, at p. 142, vol. xviii.

With respect to the planets, there is still the old and capricious chariness of information. Thus the reader is told when *some* of the planets pass the meridian *one* day (the 15th) in each month. Why cannot the editors fill up some of the spare room in the column of "Sundays and remarkable days," with the times of the planets risings or settings, two or three times in each month, as is done in *Moore's Almanac*, or exhibit their times of *southing* frequently in each month, as is done in Partridge? Or why not imitate the admirable fulness of little Goldsmith?

The information given about the planets is not always accurate. Thus, we are told that Mercury "is *invisible* throughout the month," both in April and October; whereas our friend Moore informs us that Mercury may be seen near the western horizon soon after sunset *about* October 16th, and near the eastern horizon a little before sunrise about April 8th. And we confess we cannot but think the astrologer is right, and not the scientific men of the Society; for we learn from White's Ephemeris, p. 42, 43, that Mercury is at his greatest eastern elongation on the 16th of October, and his greatest western elongation on the 7th of April.

In the British Almanac we are assured, page 18, that the *Spring quarter begins* on the 24th of March: Moore, on the contrary, page 45, tells his readers that the Spring quarter commences "on Saturday, March 21, at 7h. 56m. 8s. in the morning;" and unless the gentlemen of the Diffusion have detected some blunder in the Nautical Almanac, or make Spring commence when the sun enters the *fourth* degree of Aries, we must give our judgment again in favour of Moore, notwithstanding his "Astrological predictions, and other pernicious matter."

We observe that *St. Peter* is united with *St. Paul*, June 29. How is this? It is not so in Lord Macclesfield's Act; not so in the Calendar in the Prayer Book; not so in the rules which the Society prescribes for its own guidance in almanac-making, at page 4.

There are some blunders in the Law Terms. At page 11, we are told that, "when the *terms themselves commence* on a Sunday, as on Jan. 11, the term is dated from such day." This is in the teeth of the Act of Parliament, which declares expressly, that "Monday is in all cases to be substituted for the Sunday, when it shall happen that the day would fall on a Sunday"—that is, the term is to commence, not on the Sunday, but the Monday. Again, *Easter Term* is made to end May 12, and Trinity Term to begin and end May 26 and June 16, respectively, which are each *one day too early*, unless Sunday be, by law, "a day of business." The fabricators of the mock-almanacs to which we alluded in the outset of our present notice, must be pleased to see that, as regards the liberties they have taken with the Law Terms, they have the counte-

f so respectable a body as the

re indulged, under the head of al Information," with a delight- ncocted table of "Kings and of England, from the Conquest," n the *times of commencement* of HAN HALF the specified monarchs n *erroneously!* This is the case ch of the first fifteen, from Wil- o Henry VI. inclusive; and with to James I., William III., and Anne. The error shows itself ies in days, sometimes in months s, as Henry II., Oct. 25, instead 19; and sometimes to the amount nplete year, as in respect of Edw. as. I., Will. III., and Anne. The is the most extraordinary in the William III. It is well known landed on the Devonshire coast . 1688, and that the statute st William and Mary states, that h of February, 1689, was "the which their Majesties accepted vn and royal dignity of King and of England." But, no, say the ien of the Diffusion Society, it eb. 13, 1688; that is, about nine *before* the glorious revolution. the way in which they supply eaders with accurate historical Surely we shall not be accused ue partiality, if we again refer ho wish for accuracy to the per- ccurate table of the same kind y Moore.

e are many other mistakes in mat- general information in the British ic, which, considering the faci- access to public and official do- s possessed by the Society is astonishing. Thus, p. 39, the f Sardinia there mentioned died 1831, and was succeeded by Amadeus, born Aug. 16, 1800. 'Lean, stated, p. 58, to be in the nd of the forces in Ireland resigned pril or May; and the Colonial (Robinson and Carr) appointed, ave still their mitres to receive.

e of the mistakes which we have out in the British are not of moment; but they, one and all, o prove that the gentlemen of the on Society when they set them- up as reformers *par excellence* of ic literature—*when they talked of* producing such an almanac as the world never before saw—over-rated their own powers prodigiously. They have not yet produced, though they have been five years at the task, an almanac which has not been disfigured by the grossest blunders; some arising from careless- ness, but more from downright ignorance and stupidity; and, according to all pre- sent appearances, we shall have to wait as many years more, before we shall be able to congratulate them on such a successful result of their labours.

LIST OF NEW PATENTS, GRANTED BE- TWEEN THE 24TH OF OCTOBER, AND THE 25TH OF NOVEMBER, 1834.

John Hearle, of Devonport, engineer, for im- provements on engine-pumps, applicable to ships and every other purpose that a pump can be ap- plied. Nov. 3; six months to specify.

Joseph Gibbs, of Kennington, engineer, for im- provements in carriages and in wheels for cariages. Nov. 3; six months to specify.

Samuel Bagshaw, St. James's, Middlesex, for an improved filter for water or other liquids. Nov. 6; six months to specify.

Peter Rothwell Jackson, of Bolton-le-Moors, Lancaster, engineer, for improvements in hydraulic presses and pumps. Nov. 6; six months to specify.

James Walton, of Sowerby-bridge, York, cloth- dresser and finisher, for improvements in the ma- chinery used for raising the pile of woollen and other cloths. Nov. 12; six months to specify.

Daniel Rutter Long, of Bath, chemist, for a new mode of applying certain anteputrescent and fla- vouring substances to meat. Nov. 13; six months to specify.

Jean Michel Cramer, of Leicester-square, me- chanic, for an improved steam-engine. Nov. 13; six months to specify.

Lemuel Wellman Wright, of Sloane-terrace, Chel- sea, engineer, for improvements in machinery or apparatus for making paper, being a communica- tion from a foreigner residing abroad. Nov. 15; six months to specify.

Charles de Bergne, of Clapham, engineer, for improvements in machinery for spinning or twist- ing cotton, flax, silk, and other fibrous substances, being a communication from a foreigner residing abroad. Nov. 15; six months to specify

Edward Galley Giles, of Lincoln-inn fields, Gent., for improvements on apparatus for engraving on copper and certain other substances, being a com- munication from a foreigner residing abroad. Nov. 15; six months to specify.

Samuel Garner, of Lombard street, Gent., for an improvement in the art of multiplying certain drawings and engravings or impressions, being a communication from a foreigner residing abroad. Nov. 15; six months to specify.

William Crofts, of New Radford, Nottingham, machine-maker, for improvements in machinery for making figured or ornamented bobbin-net, or what is commonly called ornamented bobbin-net lace. Nov. 20; six months to specify.

William Wells, of Salford, Lancaster, machine-maker, and George Scholefield, of the same place, mechanical draftsman, for an improved apparatus or machine for cutting the pile or cords of fustians and other fabrics, manufactured of cotton, wool, and other fibrous materials. Nov. 20; six months to specify.

Robert Whiteside, of Air, wine-merchant, for improvements in the wheels of steam-carriages, and in the machinery for propelling the same, also applicable to other purposes. Nov. 20; six months to specify.

Alexander Craig, of Edinburgh, for improvements in steam-engines, being a communication from a foreigner residing abroad. Nov. 25; six months to specify.

James Lutton, of Tudor-place, Tottenham-court-road, chair-maker, for improvements on castors for furniture. Nov. 25; six months to specify.

Robert Joseph Barlow, of Rudley, Yorkshire, for improvements in springs applicable to carriages and other purposes. Nov. 25; six months to specify.

James Couch, of Stoke Devonport, Captain R. N., for improvements in ships' channels. Nov. 25; six months to specify.

Jacob Tilton Slade, of Carburton-street, Fitzroy-square, for an improved metallic sheathing for the bottoms of ships or vessels. Nov. 25; six months to specify.

John Donkin, of Blue Anchor-road, Bermondsey, civil-engineer, for improvements in the machinery for making paper, being a communication from a foreigner residing abroad. Nov. 25; six months to specify.

NOTES AND NOTICES.

Mr. Telford's Will.—The will and codicils of the late Mr. Telford have been proved by the executors in the Prerogative Court, and the personal estate sworn to be under 35,000*l*. He bequeaths about 3,000*l*. to divers charitable institutions, and there are legacies to several persons of mechanical genius, altogether amounting to 16,000*l*. Among the rest there is 500 guineas to Robert Southey, the poet-laureate. Mr. Telford directs, that, in the event of his property not amounting to 16,000*l*., the legatees should abate in proportion; but should it prove more than sufficient, they are to be entitled to the full benefit in proportion to the amount of property left. The amount of the legacies will, therefore, be doubled; and the Laureate, instead of 500, will be entitled to 1,000 guineas.

Mrs. Somerville.—The Emperor of Russia has presented to our distinguished countrywoman, Mrs. Somerville, an extremely valuable opal, set with brilliants of the first water, "as a token of sincere regard and admiration."

The Mariners' Compass is generally stated to have been invented by one Flavio Gioia, a native of Amalfi, in 1302 or 1303. But, from a letter on the subject, addressed to Baron H. A. Humboldt, by Mr. J. Klaproth, reviewed in the *Athenæum* of Saturday last (No. 369), it appears very clearly that the magnet's polarity was popularly known in Europe at least a century earlier, and in China as far back as authentic history reaches. "A remarkable proof," says the reviewer, "of the Chinese claims to this invention, is to be found in the history of the *magnetic chariots*, whose origin is lost in the obscurity of the mythological ages." * * A (human) "figure, in front of the chariot, was made of some light material; it was fixed upon a pivot, and its finger invariably pointed to the south, which was the kibleh or sacred point of the Chinese, to which they always turned when performing their devotions. It is intimated, rather obscurely, magnetic chariots were first invented for purpose, namely, to enable the devout their *kibleh* when the sun and stars were by clouds—a purpose for which the com quently applied in the present day by M dan nations; but there are very full desc the use made of these chariots in dir march of armies, and guiding ambassado As our readers have probably anticipate netised bar passes through the arm of and the only variety of ingenuity displa architects was in balancing the figure upo The antiquity of these magnetic chario blished incontrovertibly; the step from compass is so very easy, that we may s that the one must have led immediat other."

Change in the Colour of Chameleons.—on this subject in the *Edin. Phil. Jour.* Edwards, Esq., after narrating a course ments upon two chameleons, by observa life, and dissection after death, he comes lowing conclusions:—"1st. That the ch colour of chameleons does not depend either on the more or less considerable their bodies, or the changes which might h on the condition of their blood, or of the tion; nor does it depend on the greater tance which may exist between the se neous tubercles (the opinions of several n although it is not to be denied that the stances probably exercise some influenc phenomenon. 2dly. That there exists of these animals two layers of membra ment, placed the one above the other, b in such a way as to appear simultaneo the scarf-skin, and sometimes so that th conceal the other. 3dly. That every thi able in the changes of colour which man selves in the chameleon, may be explai appearance of the pigment of the deep an extent more or less considerable in t the pigment of the superficial layer, o disappearance underneath this layer. these displacements of the deeper pigm reality occur; and it is probably a con them that the chameleon's colour char life, and may continue to change even 5thly. That there exists a close analog the mechanism by the help of which the colour appear to take place in these re that which determines the successive and disappearance of coloured spots in of several of the cephalopode mollusca."

The London and Birmingham Rai pany have published notices of their i continue the railway to a vacant piece o Euston-grove, on the north-side of street, near Euston-square.

The Supplement to Vol. XXI., contai Contents, and Index, with a Portrait, o the late Mr. Telford, from the Bust in sion of the Institution of Civil Engine ready, Price 6d.; also the Volume c boards, Price 8s.

Communications received from G. L —G. B. — Mr. Shires—Mr. Baker—P. Jopling.

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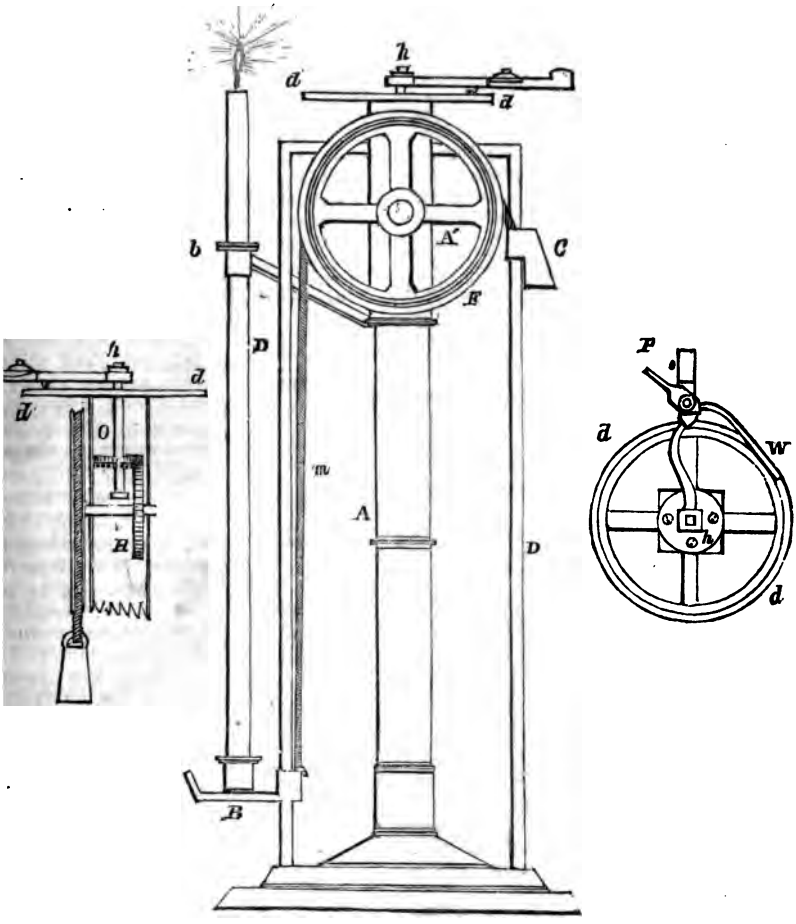
CUNNINGHAM'S SELF-SNUFFING CANDLESTICK.



SELF-SNUFFING CANDLESTICK.

Sir,—Having once heard an individual express astonishment, that, in this age of invention, no person had contrived a candlestick to perform the operation of snuffing the candle it contained; and expressing a doubt, at the same time, as to the possibility of accomplishing such an object, it induced me to turn my attention to the subject, and among a number of contrivances to perform the same, the accompanying presented itself as the most efficient.

Though at best only a mechanical toy, still some of your readers may be amused with the novelty of the thing; to some few—even persons without hands—it may happen to be useful.

A is the candlestick, of any pattern, having its top square and hollow at A′; B is a candleholder, sliding freely on a guide D, and connected with a weight C on a similar guide, by a line or chain *m*, passing over and in a groove, in the wheel F. On the shaft of F, in the interior of the hollow top A′ (see the sectional view, fig. 2), is a vertical spur-wheel H, which communicates with a crown-wheel on the vertical shaft O, which, protruding through the top, has fixed to it one leg of the snuffers at the point *k* (see fig. 3): *d d* is a circular plate, screwed on the top of the candlestick, and furnished at the point W with a catch, which, in the revolution of the snuffers, presses against and opens the moveable leg as in fig. 3, until they arrive at the wick P, when the leg slips off, and the spring in the snuffers closes them on the wick. As the force of resistance given by the moveable leg is at this juncture withdrawn, a spring on the fixed leg now commences a pressure on the circle *d d*, equal in resistance to the closing spring, and continues it until the catch W again performs its office. Thus the force required to produce rotation is equalised. We will now consider the manner in which that force is produced.

The weight C (allowing to it an additional gravity to overcome the friction, and the resistance given by the springs,) is equal to the holder B. Thus the two produce equilibrium in the wheel F. Now, as the candle burns away it loses in gravity, and this loss is given to the weight C, which descends, *the slide D′, pulling* up the holder B, *thus turning the* wheel F, and producing rotation in the snuffers. But as C would in time accumulate so much gravity by the consumption of the candle, as to make the wick rise above the level of the snuffers, the slide D′ is hollow, and in it is a spiral spring, which acts upon the weight C, and retards the descent of it in the same ratio that it accumulates gravity, allowing sufficient, of course, to drive the wheel F.

Thus it will be perceived that the candlestick only snuffs its candle when it requires it; for the faster the candle burns away, the longer must get the wick, the swifter the wheel F must turn round, and the oftener the snuffers must snuff, and *vice versâ*—fairly claiming the appellation of a "self-snuffing candlestick."

In the event of the candle running down, the grease is received by a holder *b*, which also keeps the candle in a perpendicular direction.

HENRY DUNCAN CUNNINGHAM.

Gosport, Nov. 6, 1834.

CAOUTCHOUC COATING A GOOD SUBSTITUTE FOR LEADEN COFFINS.

Sir,—The enormous expense which individuals are frequently put to, in the interment of their deceased friends, has for some time directed my attention to this subject, and I think I have now hit upon a plan which will greatly obviate such expense, and which will preserve the body as effectually as if laid in a leaden coffin. The mode by which I propose to effect this is by the application of caoutchouc, or India-rubber, which being quite impervious to damp and air, must, of course, preserve the body as if preserved in clothes after the manner of the Egyptians.

The body, to undergo this operation, being laid out, is to be brushed over with a solution of India-rubber five or six times, until it is of a sufficient thickness; this done, nothing else remains but putting it in a light wooden coffin, and interring it. If the subject is in a state of decomposition, I propose only wrapping it in an India-rubber cloth. I have tried this plan on small quadrupeds, and find it succeed admirably, therefore, I see no reason why it should not succeed as successfully with a human body. I am, Sir, &c.

E. B.

Nov. 26, 1834.

XLE-TREES AND AXLE-FRICTION.

—Since the period of the discus-
in your pages, on the subject of
and other carriages, caused by my
res on the Foreign Quarterly Re-
my attention has been much di-
to the subject of axles and axle-
, which, taken in all its varieties,
natter of more importance to the
unity than almost any other ques-
mechanics. It is a question of
onomical consumption of *power*,
ling through almost every branch
hanical art, and as a question of
al economy, it is important that it
be thoroughly understood, not
by theoretic writers, but by all
nical workmen and their em-
.

re are many good workmen who
exceeding crude notions on the
of friction. Some believe that
be done away with altogether.
who do not go that length, think
ly important to diminish all bear-
rfaces to the utmost practicable
These people are great advo-
or making upright shafts rest on
conical points, instead of semi-
r balls working in cup sockets.
have heard one of them gravely
that, for an horizontal axle, a
quare, case-hardened bar working
llow hardened cylinder, was better
ll others. Why? because there
s surface friction! It was impos-
make him understand that the
of the friction being thrown on a
instead of a broad surface, could
any way diminish its total amount,
at, as a practical matter, the abra-
surface must be greatly increased.
vo metallic surfaces be brought in
, and motion be kept up with
nt force and velocity, heat will be
, and the metal will increase in
The harder and the less porous
tal may be, the greater will be the
required to produce the effect,
rasion of the surfaces will at last
lace, and the metals will have a
cy to unite or weld together, as in
e of an axle and box "sticking
If oil be introduced between the
faces, the abrasion of the metal
take place. The metallic sur-
e fixed bodies, the particles of the
rolling bodies. The movement
becomes easier, and the diminution of resistance is called the diminution of friction. But the friction has not ceased to exist. It is merely that the greater portion of it is transferred from one body to another, from the surface of the metal to the surfaces of the globules of oil; what the metal saves the oil loses. The advantage consists in preserving an expensive material, such as an axle-arm surface, and consuming a cheaper material, such as oil, which can easily be renewed. This fact furnishes a rule for the *size* of axle-arms, independently of the strength of material which may be required. The surface bearing must be so proportioned to the superincumbent weight, that the flow of oil between the lower side of the axle and its box may never be interrupted. If the arm be too small, the oil, which is a series of rolling bodies, will all be squeezed out by the superincumbent weight, the metallic surfaces will be brought in contact, and abrasion will ensue. If, on the contrary, the axle-arm be too large, unnecessary friction will be caused, as well as superfluous weight. But, of course, the axles of steam-engines and mills require much less proportional strength than those of wheel carriages and locomotive machines. Where momentum is added to weight, the surface bearing must be considerably increased, or the flow of oil between the axle and box will be checked, if not altogether stopped.

As it is clear that a free flow of oil is necessary between the surfaces, it is clear also that the flow of oil should, as far as possible, be rendered constant. In the case of a lathe mandril, the waste of oil is comparatively of little importance, consequently the best mode is to have a funnel-shaped column of oil pressing downwards on the working part, and freely passing off on either side the bearing. Oil, which is confined between two moving metallic surfaces, becomes thickened like tar. A lamp, which is fed by a stream of oil constantly pumped through the wick, gives a more brilliant light than the ordinary kind of capillary lamps; the better portions of the oil are alone consumed, and a similar effect is produced by a stream of oil on an axle. In wheel-carriages and locomotive-machines, whose wheels are fixtures on the axles, this contrivance can be resorted to, but of

course the consumption of oil must in such case be considerable. In wheel-carriages, whose wheels are moveable on their axes, there would be considerable difficulty in thus feeding the arms with oil; and in carriages which require neatness, the dirt and filth would be a great objection. Therefore the desideratum is, to carry the greatest quantity of oil with the least possible waste, and without making the wheel centre unsightly in its exterior form. Oil, wherever it can be used, is the best of all lubricating substances for metal, because it is the most fluid, *i. e.* the rolling particles pass each other with the greatest facility.

The earliest axles for wheel-carriages were made of wood, and of a conical form, for two reasons; first, that it is easier to fit a nave or box on a conical arm than in one of a cylindrical form; and secondly, in case of wear, the arm may be refitted, by the wheel being worked farther up. The same form was continued, for the same reasons, when iron axles were introduced. Since that period innumerable inventors have tried their heads and hands at the improvement of axles, and scarce a year passes that several patents are not taken out to die a premature death.

The commonest metal axle used at present is of a conical form, with a broad flat ring or washer driven firmly up to the shoulder against which the wheel-box works. The wheel is secured against coming off by a front washer, behind a strong linch-pin. A thick unctuous grease is used for lubrication, to contain which deep channels are sunk in the box.

The next kind, instead of a washer and strong linch-pin, is provided with a screw-nut, formed to screw on the axle end, in the direction in which the wheel turns, to keep the wheel on. Through both nut and axle a small linch-pin is driven. Some of these nuts are four-sided, others six and eight-sided, and are consequently pierced with two, three, or four mortices for the linch-pin, in order to regulate the play of the wheel.

The next kind is the mail axle, so called from having been first used in the mail-coaches. This axle is provided with a solid flat collar at the shoulder, against which the box of the wheel works. *This axle has neither* front nut, washer, or linch-pin. The arm is cylindrical, and is cut off flat at the front end; the front end of the box is closely stopped with a plate or screw, between which and the end of the arm there is left a hollow space, for the purpose of containing oil, which is supplied by loosening a screw-pin in the front of the box. At the back of the box, near the shoulder, there is a second reservoir for oil. The wheel is retained on the arm of the axle by three or four long bolts, which pass through the nave from front to back, and thence through a circular plate of thick iron, as large as the nave, which works against the back of the solid collar. Between the solid collar and the axle-box, a thick leathern washer is placed, to prevent any jar arising. The play of the wheel is adjusted by screwing up the nuts of the long bolts against the circular plate. The advantage of this axle is, the security it affords against the wheel coming off, by three or four separate bolts. But it is otherwise very imperfect, as the oil wastes very rapidly when the wheel is in work, and the end of the axle, not being secured in front, there is an irregular elastic motion, which causes the arm to wear unequally at the shoulder, after a short time, and then the oil disappears still more rapidly. The mail axles are most commonly hardened, both arm and box, to guard against this; but it is of little avail. Mail axles are supposed to be lubricated with oil; but the fact is, that unless they be oiled every three or four days, they are actually lubricated with water. The process is thus. The front reservoir is level with the bottom of the axle-arm, and consequently is level with the drainage or leakage point at the leathern washer. When the wheel is in motion it acts as a pump, and in a very short time drains off the oil of the front reservoir into the back, till it overflows; consequently the front is left dry. The bottom of the back reservoir is about an inch below the leakage point, and therefore it does not lose its oil by the same process as the front; but it loses it, nevertheless. In the process of washing the wheel, and also in rainy weather, water gets in between the washer and the box. Water, being heavier than oil, sinks to the bottom of the reservoir, and the oil flows off. Thus it is that almost every mail axle, which is not oiled every few

days, gets rusty and spoiled. While the oil lasts, of course, the friction is less than that of a comon axle; and, as before remarked, the security is greater against the wheel coming off, but, take it altogether, it is, though a neat-looking, a very imperfect axle.

The next kind of axle, and the best which has been hitherto invented as applicable to ordinary wheels, is that known under the name of "Collinge's Patent." The original specification was, I believe, "a cylinder secured between two cones." But an axle on such a principle would not run smoothly; it would jar violently in the end-play against the shoulder cone, and consequently the axles are never made so. The collar at the shoulder, against which the face of the wheel-box runs, is made very broad, flat, firm, and solid, and is, moreover, provided with an external rim or guard, which covers the end of the box, and excludes dirt and water. Close to the face of the box there is a reservoir of oil, and between the box and the collar there is a washer of solid leather. The centre of the arm is slightly turned down in the lathe, below the surface, to afford a lodgment for oil. The front of the arm beyond the box is turned down about a quarter of an inch, and a flat side filed on it. Upon this a small collar of gun-metal slides, the outer side of which projects in a conical form against the front end of the box, which is formed into a similar shape to receive it. Through this gun-metal collar a small hole is pierced to allow the passage of oil. It is thus evident that when the wheel is in motion, owing to the flat side, the coned collar has no lateral motion, though it can slide along the arm and regulate the play of the wheel. This collar is turned in the lathe when fixed on the arm, consequently it must fit accurately the end of the box, which is ground on to the arm. To adjust this collar to its place, and keep it firm there, two nuts of gun-metal, with right and left hand threads, one of smaller size than the other, are affixed. In adjusting, the first nut is screwed to the proper place, and then the second is screwed tight against it, one nut wedging the other. As a further security, a spring linch-pin is driven into the end of the arm beyond the nuts. Over the whole a large cap of gun-metal is screwed against the end of the box, with a washer of thin leather. This cap contains oil in its lower circumference, reaching to the horizontal level of the leakage point at the shoulder. The cap may be entirely filled, if it be wished, but it is useless, because the action of the wheel in turning would pump it away and waste it very rapidly. If it be wished to increase the quantity of the oil, the proper plan is to increase the circumference of the cap. The mode of feeding the axle is by the two reservoirs turning with the wheel, and the oil thus *washing up; and this is the only principle upon which locomotive axles can be fed with oil without wasting it.* Properly supplied with oil, a set of Collinge's axles, as they are at present made, will run about 5,000 miles without sticking fast. The wheel is 5 feet 6 inches in diameter, which is about the height of the fore wheels of a full-sized carriage, weighing about a ton. The hind wheels would, of course, run farther with the same quantity of oil. As the arms of the axles are not horizontal, but dip downwards, the bearing is principally against the shoulder, and there is consequently little strain on the nuts; and the cap also, in this position, holds more oil. But the friction must be increased. A horizontal arm runs with much less friction than a dipping one, because the dip serves to remove a part of the weight from the hardened arm against the softer washer.

With the exception of those used in railway and steam vehicles, axles are all but universally dipped, or inclined downwards at the arms. There are sundry reasons for this. First, the extra security against the wheels coming off. Secondly, the greater facility of retaining the oil. And, thirdly, the facility it gives for using dished wheels. The advantages of the dished wheels are, that, while keeping the same track on the ground, the length of the axle is not increased, and greater space is afforded for the body of the vehicle; and, at the same time, the dished form is stronger than the plane. When rightly adjusted, the under spokes should be in a line exactly vertical to the base, and the upper ones form the angle. The strongest form of wheel is that in which the spokes are framed angle-wise to the nave, alternating both ways to form a double cone,

but this materially increases the length of the axle-arm, and renders the nave unsightly.

The disadvantages attending "Collinge's Patent Axle" are, considerable extra weight, owing to the thickness of the box, which is usually made of cast-iron. The length of the arm is also increased by reason of the collar, double nuts, and cap; and, altogether, a nave larger than ordinary is required for its insertion. But the advantages are so great, that whoever uses a vehicle with common wheels, travelling at the rate of five miles or more per hour, must be ignorant of the science of profit and loss, if he does not use them. The mere labour of keeping other axles properly greased or oiled, and the risk of abrasion from neglect, together with the waste of oil and grease, and extra risk of coming off, will make a heavy balance against the comparative cheapness in the first cost of the common axles. The axles which I have examined, bearing the name of "Charles Collinge, Lambeth," are, for the most part, as well made as the best engineer's work usually is; in short, they are as accurately finished as is necessary for any practical purpose. The only thing objectionable in them to the general purchaser, is their high price; but for a man who keeps a pleasure carriage, and is not a judge of workmanship, the wisest course is to pay that high price, and place it to the account of what Mr. Babbage has so well termed *verification*. Twenty-five guineas is the price, I believe—but they may be had of other makers for two-thirds of that price, some of them equally well made with those marked Charles Collinge, and some of them the merest rubbish. Without good workmanship, this axle is worse than a common one. The well-made ones are formed of thin bar-iron, welded by hand into a mass (fagotted), and case hardened, both arms and boxes. After hardening, the boxes are ground on to the arms with oil and emery, consequently they cannot be perfectly true cylinders, though intended to be so. Birmingham made axles have of late, on account of their cheapness, come much into use; but, unless coming from a known maker, they are not to be trusted, as, to save expense, they are commonly made from square *rolled bars, good or bad*, subject to flaws, sand-cracks, and cold shorts. For self-axles, *i. e.* axles which are bolted to two springs at the ends, and have no other bearing, as is the case with the street cabs, and gigs generally, a good method would be to make the centre or bed of the axle of drawn or rolled tube; weight might thus be saved without loss of strength, and tolerable security would be taken for the goodness of the metal.

The axle patented by Mr. Birch, and described in No. 589, I consider to be a very imperfect one. The mode of fastening the wheel on by means of a single nut and linch-pin, is not comparable to the double nut and collar of "Collinge's Patent." Collinge's nuts, when screwed tight, become nearly as solid on the arm as though they were welded there. They are, in fact, two circular wedges, forcibly levered one against the other, without jamming the box. Mr. Birch's nut, on the contrary, cannot be made firmer without jamming the wheel fast. All screws are, in fact, circular wedges. No wedge acts firmly unless it bears on two sides. Mr. Birch's nut only bears on one side, and is kept from sliding or turning by the linch-pin: consequently it must rattle when the wheel is in motion over a rough road. The plan of coning the front of the nut against the box is not a good one, because the accuracy of the fitting depends on the accuracy of the male and female screws. To cut these threads so true as to ensure the cone working true in turning round, would require time, tools, and workmen, far too expensive for an axletree-maker's use. The front cap is precisely the same as Collinge's; the remaining difference is the introduction of the two cylindric barrels, or false boxes, between the arm and the true box.

One solitary advantage alone can attend this. If any grit, or particles of silex harder than the hardened metal, chances to get between the arm and box, it cuts the surfaces and acts as a key, causing the box to "stick fast." If Mr. Birch's arm were in this predicament, the wheel would not stick fast, because the two false boxes would revolve within the true one, unless the silex extended to their surfaces also. Against this advantage are to be set the disadvantages of a very considerable increase in the weight and size of the outer

well as the nave of the wheel.
ner boxes or barrels cannot be
n one-fourth of an inch in thick-
aking a total of one-half. The
ce between the outer box of
ınd that of Collinge, must be as
ı of a circle of three inches is to
nches and a half, or, probably
he truth, three inches and three-

Then follows the expense of
cture. It must be exceedingly
rk to adjust the barrels, which are
to an accurate fit, inside and
d if not, the jarring must be in-
e. It has not been stated what
erials are.

nat is offered in testimony of the
ıce of Mr. Birch's axle is mere
:.

e wheel of Mr. Birch's gig being
led was never again disturbed
orn out."

ery possible; but will Mr. Birch
ı enough to inform us how long it
wear it out; or, in other words,
any miles the gig run, and at
te?

: other wheel had the cap taken
and ran 600 miles."

possible, also; but what does it
It might be done with one of
e's as easily as Birch's, for aught
ere is in the construction. No-
said of the rate of travelling.

e arm was cleaned and polished,
; together without any oil; when
state the wheel ran sixty miles
sticking fast."

Birch does not say how long it
run the sixty miles, nor any thing
ondition of the axle at the end of
rney. Travel slow enough, and
nmon axle will run sixty miles
stopping, and without oil, if suf-
r large and not loaded, and the
)f the wheel be not too small.

John Conroy found the axles
exceedingly well in the carriages
Royal Highness the Duchess of

is Sir John Conroy, that faith
be given to his quoted opinion?
acquired any name of repute as
)f science or a *mechanic*? The
coachman himself would have been as good authority, after drinking a bottle of *Birch* wine. Court success depends on many more considerations than mere excellence and desert.

"John Ramsbottom, Esq., M.P., had a cabriolet with one of these axles, which was oiled on the 9th of November, 1831, and not touched till 23d of May, 1833, when it was found quite full of oil."

What, Mr. Birch, quite full—quite? No loss by friction—none, whatever? Pray how many miles had it run? Verily, Mr. Ramsbottom must be either a man of sound faith, or careless habits, if he used his cabriolet much. But more yet.

"It was was again fitted with the same oil, and the cabriolet continued in use until 12th May, 1834, when the axletree and wheel were examined in the presence of Dr. Birkbeck and Mr. Charles Toplis."

Dr. Birkbeck, it seems, did nothing, unless, perhaps, to exclaim "Prodigious!" Mr. Toplis gives a certificate that the axle was in good condition; but, I confess, I see nothing more satisfactory in the certificate, than in one of Dr. Morison's regarding his pills. A certificate, to be worth any thing, must be one given after due examination and careful guarding against the possibility of mistake. Had the cabriolet been laid up in ordinary the whole or any part of the "above two years and a half?" An axle might be filled with oil and left quiet, and thus retain the oil for two centuries as easily as two years. If Mr. Birch wishes really to test his axle, he should apply it to a stage-coach, known to run certain distances every day; oil it, and put a Chubb detector-lock on it, the key to be left with a known public man of mechanical skill. Such a trial might be taken for something, for the number of revolutions of the box round the arm might be calculated from the size of the wheel. In the work done by an axle, the weight it bears, its size, the quantity and quality of oil it uses, the distance it runs, and the size of the wheel, must all be taken into the account.

One word more. Mr. Birch is styled "the eminent coachmaker." Now, if

these words mean any thing more than a tasty painter, or an ingenious upholsterer—if they mean a scientific constructor of a wheel-carriage, will he be good enough to state the size of the wheels on Mr. Ramsbottom's cabriolet, and the thickness and breadth of the tire, as well as the quality of the iron? He can then inform us how far such wheels can run on an ordinary Macadamised road before wearing the tire off. This distance we can divide by the number of days which elapsed between the oilings, and thus ascertain the amount of Mr. Ramsbottom's travelling. Mr. Toplis does not state whether the wheels were in as good a condition as the boxes, or whether Mr. Birch puts new wheels on his boxes, or new tires on his wheels, without taking either off the axle-arm?

Seriously—Mr. Toplis, as director of a Public Museum, giving a certificate of public importance, is bound to satisfy the public as to the reason of these apparent discrepancies. There is far too much attempted to be proved in favour of mere earthly materials. Such powers are not to be found in simple oil and metal. As a Yankee would say, "I guess a ruby axle runnin in a diamond gudgeon, and oiled with anti-friction gas, couldn't do more. It beats the north pole, with the aurora borealis for a pivot-hole, all to smash. The leetle eend o' nothin, whittled down, and runnin in a moonbeam, aint to be compared to it."

Let me be understood with regard to what I have said on the subject of Collinge's patent axles. Though I consider them the best which have yet appeared, I think that the greatest possible excellence is still to be obtained.

I remain, Sir, yours, &c.

JUNIUS REDIVIVUS.

Nov. 27, 1834.

THE LATE CONFLAGRATION OF THE HOUSES OF PARLIAMENT.

Sir,—I went over the ruins of the Houses of Lords and Commons a week after the fire, and in consequence of the great heat then existing under the floor of the House of Lords, I was induced to pay particular attention to the flues, a part of which had then just been uncovered by the workmen. Observing that the flues were burnt perfectly clean, and that the tiles were vitrified to a considerable distance from their interior surface, I concluded there must have been a great accumulation of soot on fire, in addition to the fuel in the stove, to have produced so intense a heat. This opinion is strengthened by the report, which states that "*the flues had not been swept since the commencement of the last session.*" This fact, probably, deserves more attention than has yet been given to it. Perhaps it could be ascertained what is the greatest quantity of soot that has been obtained at one time from these flues, and also whether they were ever known to have been on fire before?

On entering the House of Commons the iron pillars presented a most remarkable appearance, in consequence of their being bent into so great a variety of forms, not much unlike that of the engine-pipes, twisted amongst the rubbish, which by some persons they were supposed to have been. This most satisfactorily proves that no dependence whatever can be placed on iron as a means of supporting any part of a building in the event of a fire. Brick, evidently, is the only building material that stands fire, and it is much to be regretted that the duty prevents *columns*, and many other useful and ornamental articles applicable to buildings, being made of clay. If columns were made of the finer sorts of clay, like pottery, their strength would be very great, and with care they might be made equal in appearance to marble, at probably a much less cost, and answer better for either internal or external works. These, as well as other articles, might either be glazed, so as to have something of the appearance of polished marble, or that dead or flat colour, of which a common tobacco-pipe will furnish the best idea, might be imparted to them.

I am, Sir,

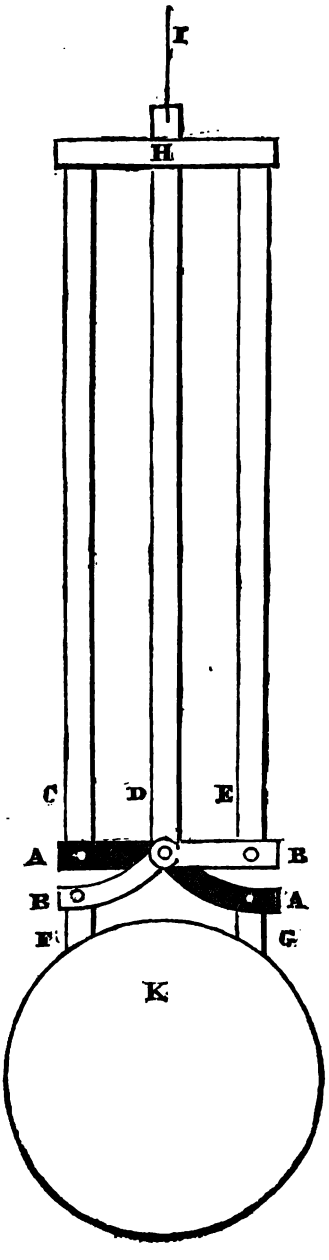
Your most obedient servant,

JOSEPH JOPLING.

31, Somerset street, Portman-square,
Nov. 20, 1834.

COMPENSATING-PENDULUM.

Fig. 1.



Sir,—Annexed is a sketch of a compensating-pendulum, the idea of which was suggested by the description of a lever-pendulum, by Captain Forman, R. N., in your Magazine for last month.

The inconvenience of that proposed by Captain Forman, is apparent from a single glance; it is, in fact, of such a form, as to be rendered practically useless. The idea, however, of two bars of expansive powers in a duplicate ratio, acting upon a lever, to produce the effect required, is extremely ingenious; and availing myself of this hint, I propose to accomplish the same effect by means of *two levers*, so disposed that the form of the gridiron-pendulum will obtain without its complicated mechanism, and the pendulum be practically useful.

Trusting that the proposed plan may not be thought uninteresting, or unworthy a place in a work which has been so extensively useful to the artisan and mechanic, I beg to submit it to the consideration of your readers.

I am, Sir,

Your obedient servant,

BENJAMIN HURLEY.

Portsmouth, Nov. 13, 1834.

Description.

A A, B B, are two levers, with equal arms (in the sketch they are drawn bent, in order to show both). The lever A A (shaded) is attached at one end to the rod C, and at the other end to the rod G, which connects it to the pendulum-bob K. The lever B B is, in like manner, attached to the rod E, and the connecting-rod F. The pendulum-rod D passes between the two levers at their centres, and a pin passing through all three (*i. e.*), the two levers, and the rod, connects them together, and thus fulcrums are formed for the levers. The pins in this case, as well as at the ends of the levers, should be fitted so as to admit of an easy motion upon them. The upper ends of the three rods are firmly fixed to the cross-bar H, and the pendulum swings in the usual way by the watch-spring I.

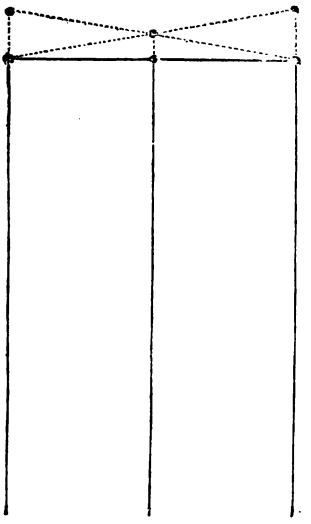
The rods C and E are made of metal, composed of 8 parts zinc and 1 part tin. The rod D is made of steel, tempered; the whole of them are flat, about one-sixteenth of an inch thick, and brought

to a knife-edge. The expansion of the zinc rods are equal to ..... .00269, that of the steel = ... .00137; which is as nearly as possible in a duplicate ratio, and they may be made exactly so by hammering the zinc rods.

Assuming, then, that the expansive properties of the rods are in the exact proportion of 2 to 1, it will follow that under any variation of temperature the centre of oscillation of the pendulum will be unaltered, and a compensating-pendulum be thus obtained, at much less trouble and expense than that of the gridiron-pendulum, invented by Harrison.

I should recommend that the adjusting-screws, for bringing the pendulum to the true time of vibration, should terminate in nuts, which may rest in a mortice cut quite through any part of the bob, such screws forming the termination of the rods F and G. This, however, with other minutiæ as to the manner of finishing the joints of connexion, &c., may be safely left to the skill and ingenuity of any good workman, the principle alone requiring description.

Fig. 2.



The diagram, fig. 2, shows how the effect will be produced by the unequal expansion of the rods, and needs no *further description.*

THE ALMANACS FOR 1835.

(Second Notice.)

We have received since our last publication two *new* almanacs, which have been published this year by the Useful Knowledge Society, in addition to the *British;* they are called the *Working Man's Almanac*, and the *Household Almanac.*

The Society state, as their reason for embarking in these new speculations, that *the British* "has always *commanded* a large sale (a significant word, that '*commanded*'); but *the price* at which it required to be sold necessarily prevented *its being adapted to the wants of the great body of the people.*" How so? Do the Society wish us to understand, that the price of the British ("the price at which it required to be sold"), was such that it would not *pay* them to do their best to "adapt it to the wants of the great body of the people?" And if so, what are we to think of the *purity* of their much boasted desire "for the diffusion of useful knowledge?" Or if they have done their best (which is the more charitable supposition), what are we to think of the feasibility of the apology they now offer for their failure? The original price of the *British* was but 6*d.* more than that of *Moore*, yet the price of Moore has never at any time prevented its finding its way into the hands of "the great body of the people." Who then can doubt that if the British had been as well adapted as Moore to "the wants of the great body of the people," it would, *in spite of the additional* 6*d.*, have found equal acceptance with them? The *fact* of the *British* not being "*adapted* to the *wants* of the great body of the people," is not to be denied; it is one to which we have uniformly borne most reluctant testimony, and which will probably be no longer disputed even by the Society's most zealous partisans, now that it is so frankly admitted by the Society itself; but the reason—the apology offered—for its inefficiency is palpably absurd. It could not be the *low price* of the British which made its calendarial computations so generally erroneous—which banished so many useful anniversaries from its columns—which caused its astronomical information to be so capricious and inexact—or which defaced its lists and tables with so many grievous blunders.

igh the price had been twice or
r times as much, the almanac
, as regards all these defects, have
precisely the same, and being the
would not have been a whit more
ted to the wants of the great body
people." Were we to admit, for
ke of argument, that the *low price, nall profit*, was the cause of the
y being so inferior—then it should
, that since the repeal of the stamp-
as enabled the almanac publisher
ve a greater profit from a smaller
the quality ought to be forthwith
ngly improved; but instead of
e have found (see our notice of
ek) that the British of this year is
very little superior to the British of
years, and is still nearly as far as
om being "adapted to the wants
great body of the people."
l; but the *Working Man's Alma-*
d *Household Almanac*, which are
rowedly published to make up for
dequate adaptation of the British
e wants of the great body of the
," must surely, at least, be of a very
ht stamp? No such thing. They are
g more than the BRITISH served
in, with a few omissions and inter-
ns, for variety sake—the interpo-
matter culled chiefly from old
rs of the British, and from other
y fresh productions of the Society.
ave the same absurd exclusion of
one-half of the Saints' Days from
lendar, as in the British (but in-
in a page by themselves, to show
ey are *not* inserted in the Society's
acs!)—the same perplexing method
rtaining the duration of *moonshine*
ter always specially attended to in
ciety's Almanacs)—the same errors
he Terms and Seasons—the same
roneous table of the Kings and
s of England—in short, the same
ue of faults precisely. Among
ings interpolated, to give a sem-
of variety to these repetitions of
itish, is a Plan for a Kitchen Gar-
p. 68, *Household Almanac*, p. 44,
ng Man's Almanac), copied from
itish of last year, and open to the
bjections as we then made to it (see
Mag., vol. xx. p. 153); and (in
usehold) a list of "articles in sea-
ach month, taken from one of the
t numbers of the British. Some
have such a turn for pilfering, that they pilfer even from themselves—like the curmudgeon who cribbed the cheese from his own mousetraps. So much at a loss have the Society been to make their three almanacs look different, though, in fact, one and the same, that they have found it convenient to borrow a leaf for the purpose from Petruchio's Art of Variety—that leaf which prescribes, by way of change, beef without mustard one day, and mustard without beef another. In both the *Household* and *Working Man's* Almanacs, there are directions given for the management of kitchen gardens, which are the same, verbatim, in both, with this material exception, that, in the former, the reader is told what garden plants are in flower each month, while in the latter this information is withheld. And this is what the gentlemen of the Useful Knowledge Society call the best possible adaptation to "the wants of the great body of the people"!

Like the *British*, the *Household* and *Working Man's* Almanacs have each a Companion or Supplement, or "Year Book" (as it is now called), three or four times the size and price of the principal work to which it is an appendage. We have a good deal to say of both these "Year Books;" but, first, a word or two as to their prototype, "The Companion to the British for 1835."

Such of the readers of our Journal as are "constant" readers (the great majority, we trust,) will probably recollect that when the British Almanac first made its appearance, we charged the Useful Knowledge Society with being guilty of pirating the tide-tables of the Stationers' Company's almanacs, a charge which they were never able to refute—that when they were afterwards supplied with a table of their own, by one of their members, Mr. Lubbock, we said of that table, and clearly demonstrated, that it was "*altogether unfit* for computing the high-water at London-docks, although employed for that purpose in getting up the computations exhibited in the British Almanac"—that it was founded on but one-half of the observations requisite to be made—and that of that half there might be many which were in error to the extent of *half an hour* (see Mech. Mag., vol. xii. pp. 295, 311, 312). Our remarks were thought

at the time, by some of the purblind admirers of the Society, exceedingly harsh and unjust. But what will those persons now say, when they peruse the following extract from an article on the tides, in the "Companion to the Almanacs for 1835," signed by Mr. Lubbock himself. Speaking of the "tables used for predicting the height of high-water at the London-docks," he says:—

"The regularity which all the above tables present, is to a certain extent *artificial*. They have been deduced from similar tables, also published in the 'Philosophical Transactions,' containing the actual results afforded by the discussion of more than 10,000 observations. The phenomena, however, are subject to *such continual irregularities*, owing, I believe, chiefly to the action of winds and storms, that, notwithstanding the immense number of observations employed by Mr. Dessiou, the results actually obtained presented irregularities, which irregularities have been removed *arbitrarily* in forming the tables here given. In consequence, also, of these irregularities, the superior accuracy of the tide-tables in the 'British Almanac' over other tables, calculated with the proper establishment, but with different corrections for the moon's parallax and declination, will *hardly be apparent*, in few instances; and I am not without apprehension that the *establishment* may have changed several minutes in consequence of the alterations in the bed of the river at London-bridge, since the observations were made upon which the table containing the semi-menstrual inequality is constructed. With regard to the accuracy of these and other tide predictions for the port of London, they will sometimes, but very rarely, be *out an hour*, owing to accidental causes; generally, however, they may be depended upon to within ten minutes: and it must be recollected that the observations are only recorded at the London-docks *to the nearest five minutes*, and that *it is difficult to determine the exact instant of high water, even to this degree of accuracy*, as the fluctuations near the maximum height are very minute, and the water is said *to hang*."—p. 23.

Mr. Lubbock, it will be observed, not only confirms all we said of his table, but more than confirms it. We said that he might have been in error to the extent of *half an hour*; Mr. Lubbock says himself (with greater truth than elegance), that he might sometimes be "*out an hour*."! Is, then, all Mr. Lubbock's parade of mathematical learning *come to this?* OUT AN HOUR!!! Why, the veriest dolt that ever set about computing tide-tables could hardly go beyond that—unless, indeed, he introduced blunders by design.

The other articles of the Companion for 1835 are mostly of a very useful description. We have been particularly pleased with those headed—"The Bills of Mortality"—"Statistics of Crime in France"—"Occupations of the People"—and "English and French Tariffs;" they contain within a small space a vast deal of very interesting and instructive information.

The Companions to the two other Almanacs of the Society are by no means so good. It is with them as with these Almanacs themselves—there has been too much second-hand stuff worked up into them. The Working Man's Year Book opens with a biographical notice of Oberlin the pastor of the Ban de la Roche, which has been extracted from the Society's Quarterly Journal of Education; and it is followed by an article "On the Weather," which is, in like manner, but an abridgment of some papers which appeared a short time back in the Society's "Penny Magazine." The Society seem to imagine that it is impossible to have too much of a good thing; and that, therefore, the oftener the old letter-press and wood-cuts of their works are reprinted, the better. There are none of the latter here, but enough of the former; for, in addition to what we have just noticed, there is another article (eight pages in length), entitled "Hints for the Care of Health," abridged from a Chapter of a small Work on Cholera, published by the Society in 1832. The purchasers of the whole of the Society's publications must surely very often have the enviable felicity of meeting "an old friend with a new face." The really new matter is much of a piece with the old. A lengthy one-sided abstract of the new Poor Laws forms a leading feature, and is, of course, full of the usual candid sophistry of the Penny Magazine school. Some space is also devoted to (of all things!) the "South Australian Society," the repulsive features of which are duly concealed. The excessive degree of caution displayed in speaking of the prospects of this Association, seems to show that even the Diffusion Society begins to be apprehensive of the failure of the wretched

on, and fearful of committing it- by delivering any opinion upon i's s." This is a severe cut indeed; e could the sages of "the Associa- look for support, if not to the sages he Society?" And then to go with in this half-faced manner!—Shock- We have also an article on "Drunk- s," in which it is taken for granted he vice is on the decrease, in spite idence and experience; and an- on "Self-supporting Dispensaries," ich all mention of the name of the er of these most benevolent institu- Mr. Smith, of Southam, is, with able candour, very studiously ed. The "Allotment of Land for rers" forms the subject of a chap- markable only for very gravely tell- he labourer what things to grow, ut telling him how he is to grow Of the remaining articles, some re concern the working man than do any body else; and some are, e to relate, actually "germane to atter." All the really useful in- tion the work contains might, how- be easily compressed into two or pages of the "Working Man's nac;" in which case the "Working s Year Book" would, of course, be e superfluity. This should be the gement adopted in future years. e not, we will venture to prophecy ont the aid of the ever-to-be-accursed is Moore, the seller of "half-a- n of copies") that this ninepenny book will not be generally consi- l an indispensable companion to the penny almanac—in short, that the r will not sell to one tithe the ex- f the latter.

e have ere now often animadverted e affectation displayed by some of writers employed by the Useful wledge Society, in "writing down" e comprehension of common folks; ffectation which has betrayed the writers into some very ludicrous se positions." This appears to have lly struck the Society itself, since, eir prospectus on the cover of the rking Man's Year Book," we are told, "in choosing a title addressed to working men' as a class, it is not ded to address them in a tone that convey any *assumption*, or infer, their feelings are *not to be* raised, and their understandings to be informed, in the same way that the more highly educated are instructed—that is, by sin- cerity and good sense." Unluckily, there are so many different hands (appa- rently) employed in getting up the So- ciety's works, that, while some write as if they bore this intention in mind, others go on in the old "dear children" style. While one, of the former class, for instance, with a disdain of plain English, which speaks volumes for the respect in which he holds the understandings of working men, advises them to avoid "*acescent* articles of diet;" another, of the latter class, thinks it necessary to make it easy to the meanest capacity to comprehend what is meant by the puzzling proverbial equivalent for "a bushel of March dust;" to wit, a king's ransom,—"by which ransom," quoth the learned commenta- tor, "is meant the price of a monarch's release, in the old times, when kings went to war in person, and ran the risk of being taken prisoners!!!" Who shall dare gainsay it?

The *Household Year Book* is much larger than the *Working Man's Almanac*, and its faults and merits are in propor- tion. Among the second-hand articles, there is one on Female Education, abridged from the Quarterly Journal of Education, in which the very lord of creation-like doctrine, that "the great end of female education is to fit a wo- man to be the companion of a man of sense and information," is inculcated most strenuously. The barbarism of this doctrine, and the shallowness of its pro- pounder, were admirably exposed in a late number of that excellent journal, the Monthly Repository. "Home-made Bread, and "Home-brewed Beer," are the titles of two articles, substantially cal- culated to minister to the popular notion, that there is great gain in persons manu- facturing such articles for themselves, while the notion is admitted, though in somewhat hesitating terms, to be not one of the soundest in the world. We may expect, after this, to see in next year's Household Book, full instructions for "Home-made Hats and Shoes," or "Home-made Needles and Pins." Among the articles of a better class de- serving mention, are those entitled— "The English Months," "Household Insurances," "Household Estimates,"

"Household Statistics," "Prices of Commodities," and "Weights and Measures." They treat of subjects which come very legitimately within the scope of the work, and are sufficiently well written to make it worth purchasing, on their account alone, by every head of a family.

Tempted by the success (Query, failure?) of The Useful Knowledge Society in almanac-making, another great book association, called the *Tract Society*, has this year entered the field, for the first time, with an almanac called the *Christian Almanac*.

We are happy to be able to say of this new competitor for the public favour, that it is infinitely superior to any of the trash to which we adverted last week, in its astronomical department. The rumour is afloat, that the astronomical information in the calendar pages has been prepared and arranged by Mr. Simms, whose valuable Treatise on Mathematical Instruments we noticed a few weeks ago. If so, it is highly creditable to his talents and taste, and we cannot but think that the credit should somewhere have been assigned to him in the Almanac itself. We observe that the above mentioned work is referred to at p. 13, but that the name of its author is suppressed. How, or why, is this? Much of the general information in this almanac is very neatly put together; but we cannot say that we admire the taste of some of the articles on the momentous subject of religion; that, for example, on "*Spiritual Eclipses*." Spiritual blindness is a serious thing; but what would be thought of Mr. Bate's good sense, if he were to insert an article on that subject in his useful little pamphlet on the use of spectacles? The mistake of the Tract Society is, here, precisely of the same kind. By the way, if we were members of "the *Tract* Society," we should object, upon principle, to the great and increasing divergence of their committee from the plain line chalked out by the title of that Society, and prescribed in its original plan. Five and six shilling *volumes* of Commentaries, of which they circulate *thousands upon thousands* (to the injury of the fair trader, whose risks are his own), are not TRACTS: nor are Almanacs: nor are Natural Histories of Quadrupeds, at 7*s.*, nor Leighton on *Peter, at the same price*: nor six volumes of Church History, at 4*s.* 8*d.* each; and so on, to a vast, and, with all deference to such a well-meaning body, we should say *shameful* extent. By-and-bye, if this monopolising spirit is not checked by the force of public opinion, we shall have them republishing Buchan's Domestic Medicine, with a *Collect* at the end of each chapter, to bring it within the province of religion!

We have already devoted more space than we can well afford to the merits of this useful class of annuals; but there is yet another, of which we must, before closing, say a few words. It is called the *Seaman's Almanac*, and edited by Mr. John Theodore Barker, a gentleman whose literary and scientific qualifications for the task are in every way unquestionable.

Mr. Barker apologises in his preface for the imperfections of the *Seaman's Almanac*, on account of the comparative *haste* with which it has been prepared, and says, that in the "year 1836, it is probable considerable alterations and improvements will be made, both in matter and arrangement." But why not have waited until the plan could be matured? Was there any *absolute* necessity for hurrying out a *Seaman's Almanac?* Will not those who think the Nautical Almanac too expensive, find every thing, or nearly every thing, they can need, in White's Ephemeris, and *very* much more than Mr. Barker has here attempted to present?

The arrangement is in many respects very imperfect. Thus, the moon's latitude and declination are given in the right-hand calendar pages, the declination being for the noon and midnight of each day; while the moon's *longitude* is given in a separate table at p. 23, and this longitude is only given for *noon*. The *sun's* longitude is omitted, his right ascension given; the *moon's* longitude given, her right ascension omitted.

The moon's semi-diameter and horizontal parallax are given in a separate table, at pp. 39, 40, 41. Would it not have been well, in a compendious almanac like this, to give the equatorial-horizontal parallax alone, and state, as is done every year at p. 11, White's Ephemeris, that "the moon's horizontal semi-diameter is always $\frac{3}{11}$ths of the moon's horizontal parallax at the same time?

The information respecting the planets is very meagre and unsatisfactory compared with that in White; but justice requires us to say, that the hints relative to the "planetary phenomena," on the left-hand page devoted to each month, are *far preferable* to the similar portion in the British Almanac. The longitude of the planets, however, is given but for two days in each month, and that only to degrees. Often, too, in our judgment, the wrong degree is specified. Thus, Jupiter's geocentric longitude on the 1st of February is 1° 43′ of Gemini. Mr. Barker calls it 1°. But, surely, the moment the first degree is completed, the heavenly body is *in* the *second* degree. This inadvertence pervades Mr. Barker's pages. In the computation, too, of the planets' risings and settings (which, also, are very sparingly introduced), there is often an error of from three to five minutes; and in those of the moon's risings and settings the error often runs from ten to fifteen minutes. We suspect that proper allowance has not always been made for refraction and parallax, with regard to the moon, or for the rapid changes in right ascension and declination, which require a very watchful attention in a computer.

Mr. Barker's account of Halley's comet will be interesting to common readers; but we think the monstrous diagram of Ursa Major, at p. 51, is only calculated to make ignorant people gaze, and in truth to mislead, since there is no term of qualification used, the whole being spoken of in the usual tone of recording an ordinary eclipse. Some persons doubt, upon real philosophical grounds, whether this comet will ever be seen again; many think it will be only telescopic; and Mr. Rumker, an astronomer of no mean reputation, thinks it probable this comet will be seen as early as January or February, and assigns its probable place for every ten days from January to April.

Let us not be misunderstood with regard to the *Seaman's Almanac*. We wish not to discourage its ingenious and worthy author; yet we do think, and therefore say, with frankness and kindness, that respect to the public, and respect to himself, should have prevented the appearance of this work until its plan was matured.

LONDON MECHANICS' INSTITUTION.

Sir,—The timely rebuke which you gave the mechanics of London, by inserting my remarks upon the proceedings of their last Quarterly Meeting, has had its effect. It has roused them from their lethargy, and they have come forward to prevent the Institute, which was founded for their benefit, from being altogether alienated from them. The mechanics, members at Southampton Buildings, gathered to a goodly number at their 44th Quarterly Meeting, held on Wednesday, Dec. 3, and, after some discussion, rescinded the decision of the previous meeting (which was to abolish the law rendering it compulsory that two-thirds of the Committee should be working men) by a large majority. The "Mechanics' Institute," therefore, still remains so by its laws—be it what it may in fact.

The affairs of the Institution are in their usual state—the members have continued for years to vary on one side or the other of a thousand—which, even supposing every one were a mechanic, instead of the greater part clerks and boys, would be but an inconsiderable portion of the artisans of London.

As long as the Institution retains some of its original attributes, to leaven the whole lump, it shall have my support. I beg, therefore, to conclude by informing you that I am no longer

A SECEDED MEMBER.

Islington, Dec. 4, 1834.

NOTES AND NOTICES.

The Russian Platina Mines.—A report has recently appeared, in the *Berlin State Gazette*, upon the production of platina, and the present state of the mines of that metal in the Russian empire. During ten years, from Midsummer 1824 to January 1834, the quantity of platina ore extracted from the mines in the Ural mountains, amounted to 230 quintals, which yielded upwards of two-thirds of pure metal. Of this, about 153 quintals were coined, amounting to a sum of 8,186,620 roubles. About 160 pounds were employed in the manufacture of vessels for the separation of gold from silver, and for other purposes. Estimating the amount coined as below one million sterling, and this product of the mines being spread over a period of ten years, it would appear that beyond the cost of the establishments, but little clear revenue has been derived from the mines. But as they are the exclusive property of the crown, and worked by serfs, whose maintenance may be estimated at the minimum of the cost of human support—and moreover, as the quantity of ore has progressively increased with the progress of the mining operations, it is by no means to be supposed that the Ural mines may not add, in a very considerable degree, to the wealth of the Russian empire. Platina being a metal of great unimpressibility, much difficulty was experienced in first converting it into coin—but at length a die of the most ingenious description was constructed for the purpose, by a French

mechanist, who is said to have received a very large reward. The coin has hitherto preserved an exact mean between the value of gold and silver, but how its future value may be changed by the increased supply of the ore, and its comparative intrinsic utility for other purposes than money, is yet to be determined. The coin is a handsome one, and specimens, we believe, may be seen at the British Museum.—*Athenæum.*

Origin of Mouldiness.—"Water, which holds organic substances in solution, very frequently developes living beings, viz. the *infusares*, which belong sometimes to the animal and sometimes to the vegetable kingdoms. These substances, which have been regarded by certain naturalists as the product of spontaneous generation, ought to be considered with greater propriety as owing their appearance to the development of certain invisible germs which are scattered throughout nature with profusion, and which only require favouring conditions to assume their being, and to develop themselves." "I have completely satisfied myself that mouldiness is the growth in air of aquatic filamentous vegetables. I have seen, in the most distinct way, the aerial filaments of the mould springing from the stalks of the aquatic filamentous vegetables, sometimes by a production from the side, and sometimes by the sprouting out of the extremity of one of these aquatic filaments which, in coming into the air, become by that alone a filament of mould." "I dissolved a drop of the most liquid portion of the albumen of a new laid egg in an ounce of water, and put it into a flask. This liquid was preserved for a whole year, exposed to the light and put into the dark, but it never exhibited the least trace of mould. It did not even develop a single atom of greenish matter." "A drop of acid in an ounce of water, produced mould in eight days. Mercury, whether in the state of a salt or of an oxide, completely obstructs the appearance of mould."—*M. Dutrochet, in the Edin. Phil. Jour.*—If the albumen of the egg so completely prevents mouldiness in water, might not this fact be taken advantage of in preserving in a sweet state the water on board ships? Albumen is not only harmless, but nutritive, and eggs are very cheap.—W.

Astronomer Royal to Scotland—This newly-created office, as also the Professorship of Practical Astronomy in the University of Edinburgh, vacant by the death of Dr. Blair, has been filled up by the appointment of Thomas Henderson, Esq., lately astronomer at the Cape of Good Hope. The results of his observations at the Edinburgh Observatory, on the Calton-hill, are to be reported to Government twice a year. From the zeal and intelligence manifested by Mr. Henderson when at the Cape Observatory, where he made at least 10,000 observations in the course of fourteen months, we anticipate most favourably for the reputation of the Edinburgh Observatory.—*Edin. Phil. Jour.*

The Wreck of the Royal George.—The brass guns, three in number, which have been raised from this wreck by the exertions of Mr. Dean, are 24 pounders, weighing, on the average, 51 cwt., and dated 1742, 1748, and 1759. When first raised they were loaded; the shots are as clean and perfect as the moment they came from the foundry, and the rope-yarn of which the wads are composed sound and strong. The guns are incrusted with a coat of lime, about the twentieth of an inch thick, to which several oysters have attached themselves; but these, as well as the calcareous coating, separate very easily from the metal, leaving the gun perfectly clean and sharp in its castings. Two of these guns, in addition to the king's arms, bear those of the Duke of Montague; the other, a viscount's coronet over a shield, in the upper half of which is a vertical crescent between two stars, and underneath a lion rampant—motto, "*A rege Victoria.*" A few days since some officers from the Victory went on board Mr. Dean's vessel, and fired several rounds from one of these guns. Captain Bagnold, who has carefully inspected them, thinks that the perfect and undecomposed state in which the *gun metal* has remained for half a century, suggests its utility as an alloy applicable to the sheathing of ships; and it is also worthy of remark, that whilst the *cast-iron* shot has been unassailed by the sea-water, three *wrought* iron bars, which appear to have been included in the base ring of each gun at the time of casting, are nearly dissolved.—*Guernsey Star.*

The British Association, at their last meeting, recommended that experiments should be made on heated bodies long kept in fusion: in pursuance of which, certain bodies are at present in the furnace, and will not, probably, be uncovered for examination before the lapse of *ten years.*

To make Coffee as the French make it.—Have a coffee-pot with a lip; pour into it as many cups of boiling water as you wish to make cups of coffee; let the water boil, then put in as many tablespoonsful (table-spoonfuls?) of coffee as there are cups of water, stir it in, let it simmer till the head falls. When the coffee is done, take it off the fire, pour in a cup of cold water, set the coffee on the hearth, and let it stand ten minutes, when it will be fine. For breakfast, put one cupful of this coffee to three or four cups of boiled milk, and sweeten to your taste, and you will find it a luxury at a small expense, as great as wealth can procure.—*Household Almanac.*

Fattening Effect of Fogs.—Fogs have a remarkable influence upon some birds. During a fog of twenty-four hours' continuance, thrushes, wheat-ears, ortolans, and redbreasts, are reported to become so fat that they are unable to fly from the sportsman.—*Household Year Book.*

The Lalande Medal, which is annually adjudged by the French Institute to the individual who has, during the year, contributed most to the advancement of astronomy, has once more fallen to the lot of an Englishman. Last year it was presented to Sir John Herschel, for his discoveries respecting double stars; and this year it has been given to Professor Airy, for the important services he has rendered, by his numerous observations, to physical astronomy. So much for the alleged decline of science "in England."

The Plumbers' Choke.—The director of a white lead manufactory in France has got rid of the disease known as the plumbers' choke, by allowing his workmen the free use of sulphuretted lemonade.—*Brighton Guardian.*

Communications received from Mr. Baker—Mr. W. G. Pearson—Colonel Macerone—A Constant Reader—T. T. E.—N. G.

The Supplement to Vol. XXI., with a Portrait, on Steel, of the late Mr. Telford, is now ready, Price 6d.; also the Volume complete, in boards, Price 8s.

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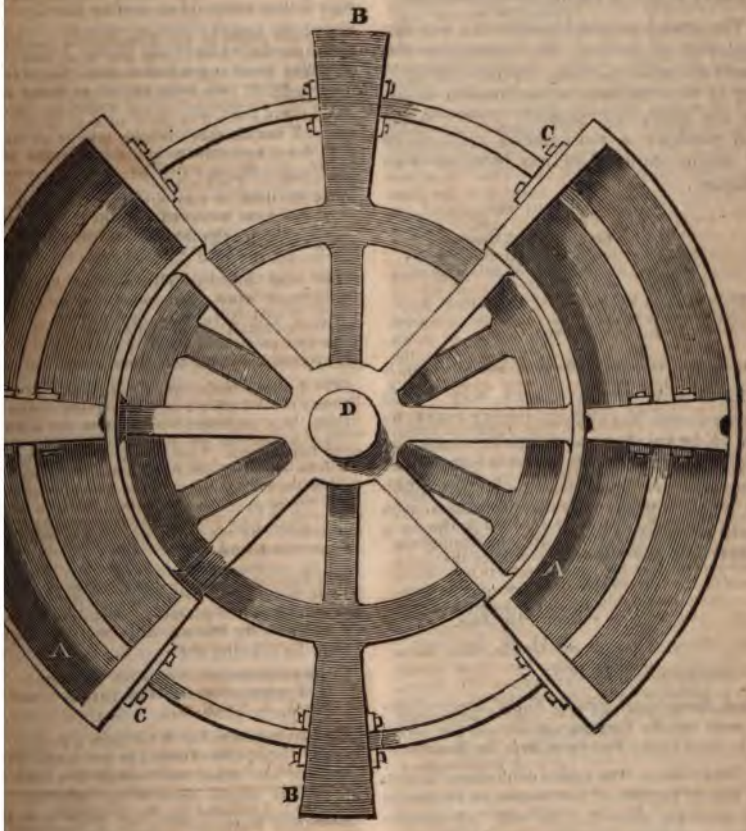
WOODHOUSE'S STEAM-WHEEL.



STEAM-WHEEL ON A NEW PLAN.

Sir,—Prefixed is a sketch for a rotary-engine *(new, I believe)*, the cylinder parts of which forms a portion of one wheel, and the pistons portions of another wheel.

A is the cylinder, or chamber-wheel; B the piston-wheel and circular rod; C the packing-boxes; D the axis. A working wheel is connected to the axis D, and the power is communicated thereto by the alternate movement of each wheel. By this plan your readers will perceive that there is not much more friction than in a common upright movement, and yet a rotary action is immediately obtained.

The grand points of difficulty are the mutation of action, the valve and the mode of backing, when required. Should any of your readers be inclined to follow up the invention, possibly it may in the end produce a more ready application of steam-power than has hitherto been adopted.

I am, Sir,

Yours respectfully,

JAMES WOODHOUSE.

Kilburn, Aug. 13, 1834.

PROGRESS OF MAN IN THE USEFUL ARTS.

Dear Sir,—I have been very much pleased with the accompanying essay, by Mr. Edward Sang, as published in the October number of Jameson's Edin. Phil. Journal. If you approve of it as much as myself, perhaps you will afford it a more extensive circulation by giving it a place in the Mechanics' Magazine.

Dear Sir,

Yours faithfully,

J. O. N. RUTTER.

Lymington, Nov. 13, 1834.

*First Essay, preliminary to the Series of Reports on the Progress of the Useful Arts, ordered by the Society of Arts for Scotland.**

When we contrast the conditions of man at remote periods of his history, we perceive an immense disparity between his attainments; and this disparity becomes the more remarkable when we consider, that of all the species of animals which exist on the surface of the earth, man alone is liable to this fluctuation.

Each individual animal attains the complete use of all its faculties; and this, even though the successive generations of the tribe be separated from each other by a long lapse of time. With many animals nothing in the shape of instruction is needed. The insect tribes at once proceed in the course that nature has designed for them. No sooner does the egg burst than the larva sets itself about the business of its existence; it swims expertly through the water, and seeks out its appropriate food. Led by an unerring instinct, it approaches the surface of the pool or climbs the stalk of some aquatic plant, and, ere the spectator has time to mark the change, it launches off in an untried element, and is undistinguished among the thousands that have had the long experience of an hour. Some again wake to life in the tough bark, and eat their vermicular way through the sapwood; till, when the metamorphosis draws near, they seek the outer rind, cut it with altered mandibles, elevate their elytra, unfold from beneath them their delicate wings, and use with the utmost ease their newly-acquired powers and senses.

Ascend, as we call it, in the scale of existence, and the elements of tuition appear. The birds, for the most part, educate their young; they lead them by short flights to seek their food, and only abandon them after their powers are fully developed. The same remarks hold of many of the quadrupeds. In all cases, however, the powers arrived at are nearly the same with each individual of a species. But when we reach the top of the scale, how different! The young of the human species receives not merely that tuition which is common to all the mammalia, but also a distinct kind of education, which conveys the fruits of the experience of all the preceding generations. Man lives to add to that experience, and though his physical powers reach to their full development, the entire man knows nothing of maturity. Powers of which our ancestors were ignorant, are now wielded by us, while we, in our turn, may be opening the way for other processes to be employed by our descendants.

The burrowing bee still uses the same instrument to pierce the downright shaft, and to cluster round it the beautifully smoothed cells. Still she selects the hard beaten soil, whence the wind may sweep the dust that otherwise would betrays her labours. The sand-spider still uses the same cement to form the walls of her retreat, and to weave her branchy net. But man is found at one time burying himself in the ground, at another tearing the rocks asunder to rear the magnificent palace. Here he draws his sub-

* Read before the Society, 5th Sept. 1834.

sistence from the ocean, there he cultivates the ground; here he clothes himself in the skin of the wild beast, there he weaves the delicate web, and prides himself in the sleekiness of his coat.

With man there is no permanence. Every thing is changing, and each season adds to his powers and comfort. He seems to possess an endless variety of appetites, that are only called into action as opportunity offers for their gratification; there seems to lurk within him an immense variety of powers, of which only a few are called into active use by any single individual. Among the animals, the history of an individual is almost the history of the tribe; but the story of the life of man is ever changing; and the mode of living of one nation appears incredible to another.

In the present paper I intend to take a rapid view of the general nature of those processes by which man gradually changes his condition; to examine into their tendencies, whether for or against the increase of human happiness; and to glance at the method of encouraging their development.

Man is possessed of a highly muscular and pliable form, capable of enduring long continued and vigorous exertion; yet the tenderness of his limbs prohibits the direct employment of his powers. The animals are invariably supplied with instruments fit for the various operations they have to perform. The bee has the proboscis wherewith to reach the bottom of the nectary; the burrowing animals have claws for digging the earth, and the beasts of prey for tearing their food. But man works entirely by *tools*. Does he wish to throw the stone, he uses the sling; the spade enables him to dig the ground. The capability of employing inanimate matter, of making it, as it were, a part of himself, is almost peculiar to man; only very faint traces of that power are to be perceived among the animal tribes; in man it is completely developed; for, on reflection, we will at once perceive that almost every operation which we perform, is done by the assistance of tools of one kind or another. When we walk we protect our feet against the sharpness of the road, and when we attempt to change the form of any hard body, we arm our hands with something harder still.

It is then not merely possible for man to employ tools in his operations; it is indispensable. His hands are admirably formed for the wielding of such tools; while with them alone he could neither dig the earth nor fashion the softest timber. Taken in the most general sense, then, the *arts* are eminently useful to our race. Some of them are necessary to our very existence.

Let us conceive man in his rudest stage, ignorant of every latent power, and using only his own limbs. View him falling before every attack of the lion, the tiger, or even of the wolf; and then fancy that some fortunate individual hurls the stone to crush his adversary. What rejoicings through the tribe! with what eagerness would they practice the new *art!* what honours would be heaped on its discoverer! Suppose then, that chance had revealed to them the nutritious qualities of some root; and that patiently they dug it with their fingers, till some one fatigued, perhaps tortured, with continued exertion, seizes the flat stone or the broken bough, and renders the operation at once more rapid and more agreeable. It is clear that the discovery of these simple tools, the *missile* and the *spade*, would increase the security and augment the power of the race; it is undeniable that with these assistants man would be happier and more comfortable than before. The labour expended in providing sustenance and defending life would be diminished, and more time would be allowed for the gratification of higher appetites. The spade, the sling, the club, or the bow, would begin to be ornamented, and man would delight himself in the symmetry and propriety of the ornaments.

On the first glance one might allow that the same principle would extend itself to every subsequent discovery, and that every means of enabling man to produce a greater effect than he could have produced before with the same labour, must augment the enjoyments of the race. Such a general statement, however, must be received with the utmost caution, since the circumstances of human society are so varied that some of them may even happen to convert the benefit that otherwise would have accrued from such improvements, into an actual evil.

So long as each individual family provide for their own wants, the principle has undoubted scope; but when different individuals have betaken themselves to different crafts, and when the community depends on the barter of good offices, an improvement in any particular art may be highly injurious to some one of the various classes. It seems clear that every improvement is ultimately beneficial to the whole commonwealth; but it is impossible to shut our eyes to the misery which is, at times, inflicted on individuals. In the present highly artificial state of society, these sinister effects are unfortunately too frequent and too severe, and it is no easy matter for the sufferers to reason themselves into the belief, that what has been productive of their own ruin can at all be beneficial to the community.

The rapidity with which changes in the

modes of operating are now introduced; and the competition which exists, not merely between the fabricators of the same material, but between those of different kinds of commodities, give an unprecedented variability to the distribution of comforts and enjoyments; so that when contemplating the advantage of some new process, one shrinks from a view of the mass of misery which its introduction may occasion. Many arts are acquired only after long practice; the power of producing certain effects with rapidity and precision, forms the capital in trade of many industrious men. But when some new mode is discovered, that capital is completely annihilated, and the unemployed workman can hardly look with any thing but jealousy on the innovation. In the old method of manufacturing paper, great dexterity was required in lifting a sheet, so that it might be of equal thickness throughout, as well as similar to others of the ream. Good workmen were scarce, and received high wages; but when the thickness came to be regulated by machinery, these workmen were either thrown idle, or compelled to betake themselves to some inferior employment; a number, indeed, readily found employment in the continental paper-work, yet still the distress must have been great among that class of men. The members of that craft, however, formed a small proportion of the population, so that the elastic constitution of human society has already accommodated itself to the new circumstances. But the hand-loom weavers have suffered more severely and for a greater length of time; their number was more considerable, and of course they experienced a greater difficulty in finding a new employment; and the circumstance, that the finer and more expensive looms were often their own property, has perhaps rendered them unwilling to desert their old employment.

Painful though the contemplation of such sufferings may be to the philanthropist, it is impossible that he can disapprove of the cause. A small class of the present generation indeed suffers, but a benefit is conferred not only on the population at present existing, but on the whole future generations of the race. The distress occasioned by the substitution of steam for hand-spinning was intense; that, however, has passed away, and the effect now is, that the peasant is able to purchase fabrics which, a hundred years ago, would have excited envy among the wealthy. The machines for forming the various parts of watches, threw, no doubt, out of employment for a time, the handicraftsmen, but a watch is not now considered as worthy the attention of a Rupert. I might cite examples without number, for in almost every instance, a decided improvement has been accompanied by temporary inconvenience, while the permanent effects have invariably been an increase in the number of hands employed, and an advance in the general condition of society.

There are, however, some exceptions. There have been improvements beneficial throughout to all parties concerned. Such are those improvements in agriculture which augment the fertility of the soil; or those in mechanics which have rendered practicable what before was impracticable. Mines and quarries which could not have been profitably wrought, had the water and the rubbish been removed by hand, have become at once productive on the application of water, wind, or steam. And remote pastures, whence the cattle could not be brought but at an expense almost exceeding their value, now regularly supply our cities. On such improvements the mind rests with unalloyed pleasure; not so when the improvement consists in the substitution of one process for another.

Since the distress of one class of workmen is often the effect of a general improvement, we might consider it fair that the community charge itself with the relief of the sufferers. The projectors of a canal, or of a railway, are taken bound to make up any loss that may be sustained by the trustees on the ordinary road; and it really appears that, with equal propriety, the inventor of some new process might be made liable for the damage thereby occasioned to those who practised the old ones. Such an enactment however, imagining it capable of being put into execution, would crush every innovation, and produce that stagnation which we see in China; it would prevent even the changes of fashion, and the shawl-weavers would at present be prosecuting actions against all the weavers of printed crape. Since distress, as serious as that produced by any improvement, is often occasioned by the caprice of the leader of fashion, with as much propriety would we define the form and material of dress as restrain the most perfect freedom in the progress of discovery. Relief need not be sought from legal enactments; yet the case is a hard one, and demands alleviation.

The principal source of inconvenience lies in the difficulty with which the workman acquires a new craft. Those workmen who are accustomed to a great variety of processes, and to a frequent change of tool, are almost secure; but the situation of those who know only one process, is deplorable. He who has never gone beyond the fixing of a pin's head, or the sharpening of its point, would be rendered completely destitute by the discovery of a method of forming a pin by machinery; but the engine-maker has never felt any in-

convenience from the general introduction of slide-rests and planing-engines. The philanthropist then, should rejoice to see the workman, not contented with a single occupation, render himself master of several crafts. A great deal of stress has been laid on what is called the division of labour. Long continued practice in a single art will indeed give at length great expertness; yet I question if one accustomed to vary his work, would not much sooner reach proficiency. In passing from the grinding of knives to the grinding of scissors, some little time indeed is lost, and a few minutes elapse ere the workman's hand has got, as he calls it, into the way. But this is only at first—after he has had frequent occasion to make such transitions, his mind has stored up the little incidents to be attended to, and no more time is needed at a change of employment, than is necessary every morning at the beginning of his day's labour. Not only would this custom of acquiring several trades give security to the workman, it would at the same time greatly facilitate the march of improvement. An interchange of methods and ideas would at once take place, and each craft would adopt some of the methods practised by another. The wright, instead of forcing an obstinate screw-nail, would use the chisel of the die-cutter to dress the destroyed cut—thousands of applications would be made of principles that otherwise would never be brought home to the attention of the artisan.

If we run over the history of the great improvements that have been made, we will find that almost all of them have come from the minds of those who have attended to a considerable variety of subjects. The great improver of the steam-engine was not an engine-maker, nor did the contrivance of the stocking-frame come from one tired with the monotonous manipulation; and I question much if any of the users of the distaff ever entertained the idea that it could be dispensed with. The method of co-ordinates of the higher geometricians, after improving astronomy and geodetics, descended to plan the slide-rest, and the planing-engine; and had no intercourse existed between the art of working iron, and the abstruse science of applied algebra, we might yet have wanted those excellent instruments. An extensive knowledge, in fact, of what can be done with materials, is essential to the contrivance of new modes of operating; or even necessary to the successful repetition of operations already known.

From the general cultivation of the minds of the workmen, we might therefore expect an increase to the *stability of human society, an improvement in the style of execution* of the various manufactures, and a more fertile inventiveness. We are apt to imagine that the improvement of our manufactures goes on by starts, and that a few names only need be mentioned in their history. The course of improvement is indeed marked by a few more considerable steps; but beneath these, and concealed from the mere casual glance, there flows a calm but rapid current. Minute facts are communicated from one workman to another, and the craft proceeds by insensible gradations; the skill of the workman gradually advances, creates a taste in the consumer for a better article, and receives again from that improved taste a reflected stimulus. Unless we had workmen skilful to execute, our best arranged schemes would fall to the ground; and unless the artisan himself were able to appreciate the beauty of execution, we would be shocked, at every turn, by deformity and imperfection. But when the mason plies the mallet, he delights in contemplating the finished cornice, and not merely, as we are apt to imagine, the prospect of gain, but also the anticipation of a higher enjoyment, cheers him through his toil. And perhaps the gratification of the architect himself is inferior to the delight felt by his better workmen, when they retire to contemplate the finished edifice.

While seeking the means for encouraging improvements in the arts, we must not then imagine that our only business is to reward the contriver of some important change. Of that task the anomalous patent laws have effectually relieved us. The principal part of our employment should be to render public each minute piece of detail, and to encourage the able workman to communicate the results of his experience. We should endeavour to improve his taste by the exhibition of finer specimens of workmanship, and to excite his emulation by rewarding superior merit. Variations almost insensible, in the modes of operating, lead to important changes in the character of the effects. Thus we attempt in vain to file a small surface flat while it is held firmly in the vice, yet the operation becomes easy when a small vibratory motion is allowed. Again, if we attempt to hone a penknife with the thumb towards the back of the blade, we soon produce a rounded edge, but on reversing the position of the blade, a thin edge is preserved. The turning-graver, when held in one position, makes criddled work; yet, when placed in another scarcely different, it produces a clean surface. The spokesheaver, when used by a beginner, is apt to round the end of a piece of wood, but a very little deviation from the ruder way of holding it preserves the proper outline. Thousands of

niceties such as these would form the workman's manual. Those workmen who have constantly resided in an isolated district, are often found ignorant of the simplest artifices of their craft; while those again who have had communication with numbers of their own trade become, from that intercourse, expert operators. Keeping facts such as these in view, our Society should gladly receive the statements of the artisan, and should lend a willing ear to communications, though their subject might be of less importance than a substitute for steam. By rendering this a place where the workman might hear the different processes described, and the principles of them explained; where he might learn the cause of the advantages of one method over another, and the source of the imperfections of all operations, we would provide an inexhaustible fund of instruction for ourselves, and, at the same time, would give a powerful assistance to the progress of invention.

Those improvements which seem likely to produce a decided effect, and those inventions that have required the concurrence of great ingenuity and severe exertion, merit our peculiar attention; and considerable difference of opinion exists as to how we ought to proceed in our attempts at encouragement. We may either propose prizes for distinct objects, or may generally offer rewards for such improvements as appear best deserving of them. In the one way we attempt to lead the mind, in the other we only approve of what has been done. Of the first, we have had a notable example in the Parliamentary offer of a reward for a perpetual motion,—a reward, the hope of receiving which has led many ingenious men to ruin.* The last approaches as nearly as possible to the natural state of things, where a meritorious action works out its own reward. We have resolved on an amalgamation of the two, so as to combine all the advantages, but all the disadvantages too, of both. This course will be attended with one important result, that in a few years our own records will furnish us with data wherefrom to draw a decision; it will then be proper to return to this important subject.

That encouragement, however, which we can give aggregately is trifling, in comparison with that which flows from our individual exertions. It is in the power of each to recommend a better article, or a more commodious instrument; and even though the newer commodity be a little more expensive than the old, it is the duty of every one to give the improved process a fair chance, in order to accelerate, as much as possible, the yet remote maturity of the human race.

EDWARD SANG.

Sept. 4, 1834.

* Is it perfectly correct to say that there has been any such "Parliamentary offer"? We apprehend not. There was a Parliamentary offer of a reward for the discovery of the longitude, that is, for the invention of the best possible time-keeper; and inasmuch as any perpetual motion must of necessity be uniform, to discover such a thing would have been to discover a measurer of time, that would have left the Harrises, the Mudges, and other chronometer improvers, completely in the shade. But to say that *therefore* the offer was actually one for the discovery of perpetual motion, *is to say that Parliament offered a reward for attaining a possible object by impossible* means.—ED. *M. M.*

SHAFT-SINKING—THE DEEPEST SHAFT IN THE WORLD.

(From the Durham Advertiser of 21st Nov., 1834.)

The shaft at present sinking at Monkwearmouth colliery, near Sunderland, has attained a considerably greater depth than any mine in Great Britain (or, estimating its depth from the level of the sea, than any mine in the world). Pearce's shaft at the Consolidated Mines in Cornwall was, till lately, the deepest in the island, being about 1,470 feet in perpendicular depth, of which 1,150 feet are below the surface of the sea. The bottom of Woolf's shaft (also at the Consolidated Mines) is 1,230 feet below the sea; but its total depth is less than that of Pearce's shaft. The bottom of the Monkwearmouth shaft is already upwards of 1,500 feet below high-water mark, and 1,600 feet below the surface of the ground. It was commenced in May, 1826. The upper part of the shaft passes through the lower magnesian limestone strata, which overlap the south-eastern district of the great Newcastle coal-field, and which, including a stratum of "freestone sand" at the bottom of the limestone, extended, at Monkwearmouth, to the thickness of 330 feet, and discharged towards the bottom of the strata the prodigious quantity of 3,000 gallons of water per minute,—for the raising of which into an off-take drift, a double-acting steam-engine, working with a power of from 180 to 200 horses, was found necessary. The first unequivocal stratum of the coal formation, viz. a bed of coal 1½ inches thick, was not reached till August, 1831 (being about 344 feet below the surface), after which the tremendous influx of water which had so long impeded the sinking operations was "stopped back" by cylindrical "metal tubbing" or casing, fitted (in a series of small portions) to the shaft, and extending from below the above bed of coal to within

26 yards of the surface. The sinking now proceeded with spirit—still, no valuable bed of coal was reached, although the shaft had passed considerably above 600 feet into the coal measures, and much deeper than had hitherto been found requisite for reaching some of the known seams. It became evident that the miners were in unknown ground. A new "feeder of water" was encountered at the great depth of 1,000 feet, requiring fresh pumps, and a fresh outlay of money. The prospects of the owners became unpromising in the eyes of most men, and were denounced as hopeless by many of the coal viewers! still the Messrs. Pemberton (the enterprising owners of this colliery) continued, and in October last reached a seam of considerable value and thickness, at the depth of 1,578 feet below the surface; and presuming that this newly-discovered seam was identified with the Bensham seam of the Tyne (or Maudlin seam of the Wear), they are rapidly deepening their shaft, in anticipation of reaching the Hutton, or most valuable seam, at no distant period, but which (if their anticipations are well founded) will be found at a depth approaching 300 fathoms from the surface! In the mean time, however, workings have very recently commenced in the supposed Bensham seam. A party of scientific gentlemen descended into these workings on Saturday last, and aided by every facility and assistance which could be afforded to them by the Messrs. Pemberton, made several barometric and thermometric observations, the detail of which will be *deeply* interesting to many of our readers. A barometer at the top of the shaft (87 feet above high-water mark) stood at 30.518, its attached thermometer (Fahrenheit) being 53. On being carried down to the new workings (1,584 feet below the top) it stood at 32.280, and *in all probability higher than ever before seen by human eye!* the attached thermometer being 58. Four workings or drifts had been commenced in the coal; the longest of them being that "to the dip," 22 yards in length, and nearly 2 in breadth—to the end of which the current of fresh air for ventilating the mine was diverted—(and from which the pitmen employed in its excavation had just departed), was selected for the following thermometric observations. (Temperature of the current of air near the entrance of the drift, 62 Fahrenheit; near the end of the drift, 63; close to the face or extremity of the drift, and beyond the current of air, 68.) A piece of coal was hewn from the face; and two thermometers placed in the spot just before occupied by the coal (their bulbs being instantly covered with coal-dust) rose to 71. A small pool of water was standing at the end of the drift. Temperature of this water at 11 o'clock, 70; 3 hours later, 69½. A register thermometer was buried 18 inches deep below the floor, and about 10 yards from the entrance of the drift; 40 minutes afterwards its maximum temperature was 67. Another register thermometer was similarly buried near the end of the drift, and after a similar period indicated a maximum temperature of 70. It was then placed in a deeper hole and covered with small coal;—some water oozed out of the side of this hole to the depth of 6 or 8 inches above the thermometer, which, upon being examined after a sufficient interval of time, indicated a temperature of 71½. A stream of gas bubbles (igniting with the flame of a candle) issued through the water collected in this hole; the bulbs of two very sensible thermometers were immersed under water in this stream of gas, and indicated a temperature constantly varying between 71.5 and 72.6. A thermometer was lowered to the bottom of a hole drilled to the depth of 2½ feet into the floor of another of the workings, and the atmospheric air excluded from it by a tight stopping of clay; this thermometer being raised after the lapse of 48 hours, stood at 71.2. Other experiments, in the prosecution of these inquiries, are contemplated.

[A correspondent (F. B.) of the *Athenæum*, observes, in reference to the preceding extract:—"I must controvert one (although not a very material part) of the statements, respecting the Monkwearmouth colliery; I allude to its being called *the deepest mine in Great Britain*, an honour which as yet it cannot certainly claim. Pearce's shaft, at the Consolidated mines in Cornwall, is, at the present time, 275 fathoms, or 1,650 feet, in depth, and therefore still maintains a slight superiority ove its northern rival, being deeper by about 50 feet. This error has arisen merely from taking the depth of Pearce's shaft a year or two ago, instead of at the present time. I may here observe, that as regards depth below the *sea level*, and, therefore (small as the approach may be), actual approximation towards the earth's centre, the Monkwearmouth colliery is correctly stated to stand unrivalled, not only in this country, but in the whole world, being, in this respect, the deepest perforation into the crust of the globe which has ever been made by man, although in depth from the surface it is exceeded by some few mines on the Continent. The following short statement will show the comparative relations of Pearce's shaft and the Monkwearmouth colliery, at the present time:—

	Pearce's Shaft. fath.	feet.	*Monkwearmouth Colliery.* fath.	feet.
Depth from the surface to the sea level ..	52 or	312	14½ or	87
Depth below the sea level	223 or	1,338	252 or	1,513
Total depth	275 or	1,650	266½ or	1,600.]

IMPROVED PORTABLE FIRE-LADDER.

Sir,—I have several times had occasion to notice the improved fire-ladders employed by the London Fire Establishment, and as I may frequently have to refer to them again, I take this opportunity of forwarding a description of them for insertion in your Magazine, the more particularly as they cannot be too well known.

Fig. 1.

Fig. 2.

Fig. 1 is a representation of one of the single ladders, on a scale of half an inch to a foot; the top of the ladder is so made, as to slip into the lower part of another, and the iron straps *a a*, and *b b*, embrace the ends, making a safe and substantial joint. As every ladder in the service is made precisely alike, it matters not in what order they are taken, as all will fit one another.

Every engine carries two lengths of these ladders, so that on all occasions the firemen can command a ladder of any required height, by joining a sufficient number of lengths together, and they have frequently found them of infinite service. When used the first ladder is held as high as the men can conveniently reach, and a second ladder is pushed up to it, the top pieces going into the straps *b b*, while the lower ends of the first ladder enter those marked *a a*, making a secure joint; the second ladder is then raised, and others added until the required elevation is obtained. Three ladders, which will reach about 18 feet, are easily handled; but when four or more lengths are to be joined, the raising of them becomes more difficult in proportion to the height; every little projection in the wall, against which they are raised, catches the ladders, and impedes their ascent.

Fig. 2 is a sketch of a simple piece of apparatus, which I have contrived, for obviating the above difficulties; it consists of two short side-pieces, corresponding to the bottom part of a ladder, with the joints *b b*. On the upper part is an iron axle, carrying a pair of small light wheels; a semicircular connecting-rod of iron preserves the proper position of the side-pieces, when not mounted on the ladder. For convenience of stowage, the wheels take off, when the whole lays flat in a small compass. Each end of the axle *c* is provided with rising springs, similar to those in an umbrella-stick, which allow the wheels to be slipped on the axle, but effectually prevent their sliding off again until the springs are depressed. These springs answer the purpose of linch-pins, without the trouble attending their use, and thus enable the apparatus to be fitted up for use in a few seconds. When mounted with this carriage, any number of lengths may be joined, and the compound ladder run up with the greatest facility, as the wheels would traverse all the inequalities of surface, cornices, window-sills, &c., with-

out subjecting the men to any unpleasant jerks and strains.

Some few provincial fire-offices have adopted this kind of ladder, and I have no doubt that when their advantages are sufficiently known, and duly appreciated, their use will become very general.

I remain, Sir,
Yours respectfully,
WM. BADDELEY.

London, Dec. 10, 1834.

THE NEW WEIGHT AND MEASURE ACT.

Sir,—On the 1st of January next, the Act for establishing a just and uniform system of weights and measures will come into force. I trust its provisions will meet with more honest practical observance, than has hitherto been the case with Acts of this description—*among the lower class of retail dealers in particular*. It was melancholy to read in last week's papers, that in the Borough of Southwark alone, sundry fines, to the amount of no less than 700*l*., were levied upon various tradesmen, for using false weights and measures. It is impossible for the fair tradesman to compete successfully in business with such fraudulent dealers as these. The worst of all sorts of underselling is that which consists in underweighing. The poor man is deceived in thinking he gets full value for his money, when he does not, and is as literally robbed as if the money of which he is defrauded were taken by force out of his pocket. I much fear, however, that no legal remedy that can be devised (except, perhaps, that Turkish one of nailing the ears of every offender to his door-post), will ever prove adequate to the extinction of the evil. There has always been—and in spite of Mr. Owen's benevolent anticipations, will, I suspect, always be—too much dishonesty in the world, to permit us to hope for so desirable a consummation. Much, certainly, depends on the character of the magistracy to whom the execution of the law is intrusted: were all magistrates, for example, as determinedly hostile to the fraudulent dealer as the late Brook Watson, there might be every thing to hope. It is with great pleasure I now recall to mind the many impressive addresses which that worthy alderman was wont to make to inquest juries on the iniquity of the users of false weights and measures, and the necessity of protecting the poor against their devices. His laudable efforts had a marked effect at the time in lessening the number of offenders, and yet now, after the lapse of twenty-eight years, we find them again as numerous and as daring as ever.

The present method of proceeding on the part of inquest juries strikes me as particularly injudicious. Can any thing more absurd be imagined than the notion of a body of public functionaries setting out to *detect secret offenders*, decked out in all the pride and pomp of wardmote grandeur, with furred robes of office on, and attendant beadles in gold-laced liveries, bearing gilded staves as big as may-poles? For whose sake is all this show? For the sake of the inquest themselves, or for the sake of the public? To persons who are in the habit of using false weights and measures, it must often be exceedingly convenient to be forewarned in this way, of the propriety of putting them *for the moment* out of the way.

To defend myself individually against being a sufferer from short weight, I keep a pair of small scales with suitable weights, and whenever I detect any dishonesty in those I deal with, I always change my tradesman, whether butcher, baker, cheesemonger, or grocer. By this method I obtain clear evidence of those who act honestly, and of those who do not. Conformably to this plan, I would suggest that every one of the police-stations (of which we have now enough in all parts of the town), should be furnished with a set of legal weights and measures, according to the forthcoming Act, so that every purchaser of any necessary articles might go there and ascertain whether he has been honestly dealt with or not. If he has been cheated, then (putting all enforcement of penalty out of view) he can have recourse to the remedy I adopt, of trying some other dealer.

Yours respectfully,
ENORT.

Marlborough-terrace, Albany-road.
December 9, 1834.

The change about to be effected by the new law, alluded to by our intelligent correspondent, is so important, that its enactments cannot be made too early

or too universally known. We subjoin, therefore, an analysis of its provisions, with some explanatory particulars, taken from the Companion to the Almanac for 1835:—

"All weights and measures which have been verified and stamped at the Exchequer, as copies of the standard weights and measures, are by the Act declared to be legal, although they should not be of similar shape with those described and enjoined by the provisions of the former Act (1824); and new weights and measures may be stamped by the proper officers, without regard to their shape, provided their weight or capacity respectively agree with that of the legal standard.

"The reason for this relaxation in regard to *form*, is to be found in that provision of the new Act which abolishes entirely, throughout the United Kingdom, the use of heap-measure. So long as the system was followed of selling as a bushel of any description of articles, not only the quantity which the measure would contain within it, but a superaddition of as much as could be heaped upon the same in the form of a cone, it was evidently necessary to determine by law not only the capacity of the bushel measure, but likewise its diameter, upon which must depend the quantity of any article that can be so heaped: a shallow vessel will allow of a large conical superstruction, while a deep measure, the capacity of which is the same, will admit of only a small comparative addition to its contents in that way. As every man sells by his own measure, the temptation would therefore be, to employ deep vessels for the purpose, and by such means the buyers — the public at large — would be wronged. This evil was guarded against, as far as possible, by the provision of the Act of 1824, which prescribed the diameter of the different measures used for selling, where this mode of measurement was employed. The abolition of this custom of selling by heap-measure proceeds, however, from a different motive, viz. that of the uncertainty attending it. The difference in the quantity resulting from the act of measuring in this way by two well-intentioned persons, whose skill and practice are not alike, is very great. It was given in evidence by the clerk of the market at Covent-garden, that, for the purpose of experiment, he had employed two different persons to measure each a peek of nuts, and that one of them put eleven, while the other could only put ten, quarts in and on the measure. If this variance occurred as the result simply of the want of *skill in one of the parties*, it may lead us to *suppose how great that* variance might be *made by design*, and where skill should be exerted to produce *the show* of ample measure with the least possible quantity of materials. It is therefore clearly to the interest of buyers to have the quantity of any given measure accurately defined, and placed beyond the reach of accidental circumstances.

"The use of heap-measure, as already mentioned, is abolished throughout the kingdom, on and after the 1st of January, 1835; and all bargains and contracts made by the heaped measure thereafter are declared void.

"The Act forbids the use of weights made of lead or pewter, and declares that none such may be stamped by the officers, assigning as the reason for this restriction the facilities afforded to the fraudulent dealer by weights made of soft materials, which may easily be falsified.

"Copies of the imperial standard weights and measures are, according to the Act, to be provided by the magistrates in quarter-sessions, for each county in England and Wales, by meetings of justices in Scotland, and by grand juries in Ireland.

"With the exception of gold, silver, platina, diamonds, or other precious stones, and drugs, when sold by retail, all articles are to be sold by avoirdupois weight. The things here enumerated, and none other, may be sold by Troy weight.

"One of the most important provisions of the Act about to be put in force, is that which abolishes all local or customary weights or measures throughout the kingdom. The Winchester bushel and Scotch ell are no more to be used. That hitherto uncertain quantity, a 'stone,' is henceforth to be every where 14 imperial pounds; and eight of these, or 112 pounds, are every where to be used as the hundred weight. A penalty, not exceeding five pounds, may be exacted for using any other system of dealing; all contracts so made are declared void, and all weights which are not strictly in conformity with the new law may be seized and condemned.

"The want of uniformity at present existing on this important subject is greater than we could have believed, until we saw it stated on the unquestionable authority of the Parliamentary Reports before us. This want of uniformity is found, not only between distant districts, but also between those which are contiguous. The boll, a measure immemorially used in Scotland, is not an invariable quantity; that which is a boll in one county is not a boll in another county; and even in the same county they sell wheat by one boll, oats by another, and meal by a third. The difference of the wheat boll in two contiguous counties is so great, that a person might buy a quantity of that grain in Haddington, and carrying it to

rgh, a distance of only 16 miles, ell it there at the same nominal price considerable profit. In Oxfordshire, nchester bushel is universally used by ners; in Kent, they use the imperial s. In Hampshire, according to one ritnesses examined (an extensive ma- rer of measures), the 'farmers de- ey will never use the imperial bushel, hey are compelled to it.' A whim- stance of want of uniformity is men- ıy another witness, who tells the Com- 'that a hundred weight of rope is ınds, and a hundred weight of twine, ame manufactory, is only 100 pounds.' article of potatoes, three different ies are delivered in London under the enomination of weight, not one of uantities agrees with that now to be hed. In the markets 120 pounds are d for a hundred weight; when bought armers, 126 pounds are required; and ıken from ship-board, the buyer re- 132 pounds."

M COMMUNICATION WITH INDIA.

—We have been so often disap- l in the expectation of witnessing ablishment of a rapid intercourse, nearer passage than the present, ur Indian possessions, that it is ısonable not to be over sanguine egard to the preparations now on accomplish the object, apparently, al earnest." It is, indeed, ques- e whether the expedition now on nt of setting out, to penetrate to by way of the Euphrates, be so ɔle, under all circumstances, as a pensive one, by a less ambitious

It is extremely doubtful whether er will be found navigable at all high a point as Bir, where it is ɔd the expedition shall embark and still more so, whether it has sufficient for the purpose at any except that of the floods.

les this, it is to be expected that ıtile tribes of Arabs on the banks, ırnish some warm work for the arty of Britons. It is true, the are to be well provided for their ɔn; but even supposing them to e to fight their way through in f all opposition, the circumstance numerous additional difficulties way of accomplishing their task, *ll have no slight tendency*, at any *retard its completion*, which is a *some importance*. It happens rather unfortunately, also, that the expedition will have to perform the overland journey, across the north of Syria, at the very time, when, according to all appearances, that part of the world will be torn to pieces by becoming the scene of a "war to the knife" between the Grand Seignior and Mehemet Ali.

The expedition alluded to is that which is to be undertaken in pursuance of the resolution of the House of Commons' Committee, who recommended a grant of 20,000*l.* for the purpose. It is under the command of Captain Chesney, whose evidence before that committee mainly influenced its decision, and is now on the very point of starting for its first destination, Scanderoon; from whence it is to proceed as far as possible up the Orontes, and then overland to the Euphrates. A steam-vessel has been built expressly for the occasion, and in such a manner, it is said, that it can be taken to pieces for more convenient carrying by land, and put together again on its arrival at Bir, as tightly as ever. It is to be feared, however, that this process may not so easily be gone through in the wilds of Arabia as in a Liverpool dock-yard.

While this enterprise is prosecuting, however, the less arduous, but not less important one, of effecting a communication by the Red Sea, will not be lost sight of. A steamer is to start from England, in February next, for Egypt, where it is to exchange letters and passengers with a vessel from India, which will set out in time for that purpose. This is to be effected, it is understood, at the joint expense of the Home Government and the East India Company. Mehemet Ali professes himself willing to afford every assistance; and, it has even been reported, that he is on the point of commencing either a canal or a railway to obviate the present difficulties of travelling across the Desert between the Nile and the Red Sea. He will, however, it is most probable, have too much on his hands for some time to come, in the war department, to allow him to devote much attention to the subject—notwithstanding it was confidently asserted, a short time back, that he had dispatched his chief engineer, Mr. Galloway, jun. (we beg his pardon, the Bey) to this country, in order to purchase the requisite materials for a first-rate railroad

across the Isthmus—and notwithstanding it is *now* as confidently affirmed, that *the canal* has been actually determined on.

The subject of steam-communication with "home" has excited great and universal interest in India, which has been any thing but diminished by the publication of two long letters from the Governor-General Lord William Bentinck, in which he states his determination to spare no exertion in carrying the plan into effect. Unfortunately the steamer Forbes, which set out from Kedgeree early in the present year, with an immense quantity of letters for Suez, met with an accident to its boiler when at Madras, which compelled it to return without accomplishing the object of its voyage. Although this circumstance must naturally have proved a "damper" to the project, the zeal for its execution does not seem to have cooled in the least, and will, doubtless, become warmer than ever when the news shall arrive of the manner in which the House of Commons has taken up the scheme.

I remain, Sir,

Yours respectfully,

F. H.

London, Dec. 10, 1834.

IRON CHIMNEY-FLUES—MACHINE CHIMNEY-SWEEPING—STEAM-KITCHEN.

Sir,—Allow me to offer a few confirmatory remarks on the letter of Junius Redivivus, which appears in No. 586 of your very useful publication. The imperfect construction of our house-chimneys, which he censures so deservedly, besides being the cause of much torture to the poor climbing-boys, is the source of another serious grievance, namely, a smoky house; for the same roughness in the internal coating, which these unhappy victims of a barbarous practice complain of, serves to obstruct the ascent of the smoke. For the last eight years I have used cast-iron chimneys, with which I am perfectly satisfied, except that I consider them rather too small. On inquiry, as regards this defect in their size, I was informed, that I could not have any thing cast of 9 inches diameter, which is the dimension I think sufficient for all ordinary purposes, without the weight being too great. I object to wrought-iron, from its liability to oxidise. Having made use of 5 inch water-pipes, which, with the exception of their size, have, in all other respects, realised my expectations, I find they answer every purpose of a chimney, and moreover warm the passages through which they pass. I have them cased in various ways, with a pilaster of scagliola, and the air which is admitted between acts as a non-conductor, and gives additional security against fire. A case of thin wrought-iron may also be used, papered, or painted, to correspond with the room through which the pipes pass, having apertures in proper situations for the admission of warm air, where and when required, which may be varied according to circumstances. By the use of such flues many advantages will be necessarily obtained, and also the very desirable object of altogether doing away with climbing-boys, whose suffering services will be rendered unnecessary. Permit me here to observe, that had the Legislature passed an Act for the better formation of flues, it would have escaped some of the ridicule which has been thrown upon it for the "Chimney-sweepers' Act," and fully answered the object of the public, which was simply to enforce the use of the machine, which has been found to do the work better than a boy. I can myself answer for its superior usefulness, not having for many years allowed any other method to be adopted in cleansing my chimneys, however averse the man employed may have been to the labour, which is, I fear, one great cause why the machine has not come so generally into use as could be wished.

As your correspondent in his letter makes some allusions to steam, I may, perhaps, be permitted to make a remark on the subject of steam-kitchens, which no well-regulated families should be without. They combine ease and cleanliness, and also economy in food and fuel, which must be considered as objects of no mean importance.

Hoping that these brief remarks may be somewhat useful in your valuable and much read miscellany,

I remain, Sir,

Your obliged and humble servant,

JAMES GILBERTSON.

Hertford, Nov. 29, 1834.

ON MANUFACTURING INK FROM COAL.

Sir,—I recollect, in reading some of the writings of Mr. Galt (the celebrated novelist and poet — I think his autobiography), that that gentleman records a most important discovery of his own, viz. the making of pit-coal a basis for manufacturing an indelible writing ink. Well knowing the liberality of disposition which dittinguishes this highly-gifted individual, I was not surprised at his disinterestedness in making a gratuitous disclosure to the public of so valuable a discovery; but I must confess that I have been a good deal surprised that no one has yet turned it to some practical account. If any thing of the kind has been attempted, it would be interesting to know the nature of the experiments made, and their results. Mr. Galt himself has been long a martyr to severe and trying bodily sickness, which has rendered him incapable of either the useful or ornamental application of his talents; but he seems now, according to the newspapers, likely to subdue the sway of sickness: and if he could but set on foot the manufacture of a writing-ink from coal, that would possess that best of all possible properties, an indelible and true black, I would guarantee him the acquisition of a worldly affluence, far exceeding any of those rewards which Apollo has been wont to bestow upon the most favourite of his sons. Mr. Galt, if I recollect rightly, speaks of the expense of the conversion of the one article into the other as almost nominal; but so did the late Earl of Dundonald anticipate showers of gold from his process for extracting tar from pit-coal forty years ago; whereas the earl's pockets became so riddled by a series of costly experiments, that he almost became destitute of a competence to cheer him in his old age. That a much better ink, than any of which we are now in possession, *might* be made, will scarcely be questioned, when it is considered how much superior the ink of former times was to those of the present. Our two great national records, Doomsday Book and Magna Charta, are both written in ink, which bears at this distant time as fresh a complexion as if written but yesterday. There is nothing of the present day—age I should say—that will bear a comparison with them. One material *cause of the rustiness which* generally appears on modern letters and books a few years after they are written, is the adulteration of the paper. I allude to the use of manganese, salt, raw sulphur, &c., to aid the bleaching process, and the rascally infusion of plaster of Paris to aid the weight. In the Statutes printed in black letter, as far back as the reign of Henry the Eighth, the ink is still beautifully black, and the paper handles so firm that it rattles even now like a piece of thin vellum. The binding, too, of these statute-books, though nearly 300 years old, is as tight as if but the workmanship of yesterday; whereas, owing to the weakness of the paper of most of our modern bound books, they fall to pieces after a very few years' service.

ENORT.

Marlborough-terrace, Albany-road,
November 25, 1834.

CHEAP AND EFFECTIVE WATER-FILTER.

Sir,—The filtration of water, used as a beverage in families, being now considered of moment as a preventive of some disorders, and conducing to the general good health of the human body, I beg the favour of your valuable assistance in laying before the public the following plan to effect it.

I am, Sir,
Yours respectfully,
J. F.

Albany-road, Camberwell,
Dec. 8, 1834.

Plan.

Put into an earthen vessel, such as those which are used by sugar-bakers to form their loaves in, with a *small* hole at the pointed end, some pieces of Turkey-sponge, and on them a sufficient quantity of SMALL, *clean* pebbles, to a quarter of the depth of the vessel. Suspend this filter, the end downwards, in a barrel with the head out, leaving about 2 or 3 inches space between the end of the filter and the bottom of the barrel; the upper part of the filter *must be kept a little above* the top of the barrel, which should be always full of water. It is obvious that the sediment of the water will remain at the bottom of the barrel, and the pure water will ascend through the sponge and pebbles to the unoccu-

pied portion of the filter. It might be suspended in a cistern, or water-butt, if more convenient. The pebbles and sponge should be cleansed occasionally.

PERFORMANCES OF THE LIVERPOOL AND MANCHESTER RAILWAY STEAM-CARRIAGES.

(Form the Evidence of Mr. William Reed, Land Agent, on the Southampton Railway Bill.)

"Can you give any instances of great speed effected on the Liverpool and Manchester Railway?

"I was upon the railroad three or four days consecutively, about a month ago, and noticed the time which I was performing the journey myself. Upon the 5th of May (1833), the engine called the Leeds, with a first class train, consisting of five coaches, containing sixty-four passengers, the journey from Liverpool to Manchester was performed in an hour and twenty minutes. That engine was not assisted up the inclined plane of one in ninety-six; she ascended it without any assistance. On the following day, I went by the Etna engine, from Manchester to Newton, which is half-way, about fifteen miles; we had a waggon with a load upon it weighing about five tons, five coaches, sixty-four passengers, and the two engine-men. We did the first mile in three minutes and ten seconds, the second mile in two minutes and fifty-six seconds, and the third mile in two minutes and thirty-five seconds; and we reached Newton in forty-three minutes. I went down the railroad the same day to within six or seven miles of Liverpool, along with the resident engineer. We met a train of goods coming from Liverpool, drawn by an engine called the Fire-fly, with fourteen waggons; two of which were loaded with pigs, four with timber, eight with cotton. We met at a place called Hayton, and proceeded to the foot of the Whiston inclined plane, of one in ninety-six; there we stopped, being anxious to ascend the inclined plane without the assistance of any momentum: we detached six of the waggons, and ascended the inclined plane with the eight, without any assistance and without any momentum. The first half-mile we went in two minutes and two seconds, the second half-mile in two minutes twenty seconds, a quarter of a mile in one minute twenty-five seconds, and another quarter of a mile in one minute fifteen seconds; making, altogether, six minutes fifty-eight seconds, in doing the mile and a half; the weight drawn up was forty tons; the average speed would be rather more than thirteen miles an hour. It may be observed that this is as great a weight as a train containing 150 *passengers. We returned* down the incline, and brought up the other six waggons, and we then proceeded on a level with the fourteen waggons, weighing about twenty tons. We did the first quarter of a mile in one minute fifteen seconds, the second quarter of a mile in one minute and five seconds, the third in fifty-six seconds, and the fourth in fifty-two seconds; making four minutes and ten seconds, or about fourteen miles an hour, with seventy tons. The same engine, I was told by the resident engineer, who was with me on the occasion, had travelled 40,000 miles without any repair up to that day.

"Upon any occasion had you any opportunity of carrying troops along the line?

"Yes; upon the 8th of May last, a regiment that was ordered for Ireland, marched out of the barracks of Manchester in the morning between five and six o'clock; there were 31 carriages forming one train, and to those carriages two engines were attached: the carriages were filled with soldiers, there were 634 soldiers in the 31 carriages, with their arms and accoutrements; it was part of the 18th regiment. They came to the ground at forty-eight minutes past five in the morning, and we started soon afterwards, and the net time that we occupied in travelling was two hours and fourteen minutes. We had a little stoppage at Newton, to take in water, and so on. Thirty-one carriages weigh about sixty-two tons; and allowing each man, with his arms and accoutrements, to be about two hundred weight, that will be about sixty-three tons more, making a total of 125 tons. Another part of the regiment came in a train afterwards; thus making, altogether, between eight and nine hundred persons: they were all on board the vessel before noon on their way to Ireland, having left the barracks at Manchester in the morning.

"Did both the engines work at the commencement?

"It so happened that in one of the engines the steam was not up, and she had to be dragged along with the rest of the train; a few miles she carried her own weight along, and it was not until after about four or five miles she began to give some aid.

"Have there been improvements in the engines of late years?

"Yes; I think they have always been improving.

"Does this improvement consist in having applied cranks to both sets of the wheels?

"Certainly not; the improvement is partly in the adaptation of the working part, but more especially in having more powerful engines.

"Has not the crank been applied upon both sets of wheels the last few years?

"Not generally; it has been tried, and, I believe, it is a matter of doubt which is the better mode.

"In consequence of the improvements which have been made in the engines, is it found, now that the improvement is so great, that it is hardly worth while to repair the old engines?

"There were several of the first engines used at the opening of the railroad now lying by, wanting a considerable outlay to make them serviceable; and, I believe, the practice of the company is to invest a large sum of money in buying new engines."

RUSSIAN CALCULATING BOY.

In the "Memoirs of the Imperial University of Moscow," we find the following interesting details respecting a child, who is said to display the most extraordinary genius for the solution of arithmetical problems. His name is Ivan Petroff, his age eleven years, and he is the son of a simple peasant of Ragozine, a village in the district of Kologrivoff, government of Kostroma. He neither knows how to read nor write, but resolves the most complicated problems in arithmetic by the force of his imagination and memory alone. In the month of May last he was examined by the civil governor of Kostroma, when he answered every question put to him with the utmost exactness; and shortly after Professor Pérévostchikoff, on visiting the establishments of public instruction, had an occasion of witnessing the extraordinary feats in the way of calculation performed by this boy. An enumeration of the questions put to this precocious arithmetician is then given in the "Mémoires;" but, as they are much the same in nature and difficulty as those which have been resolved in this country by calculating boys, we shall not weary the patience of our readers by transcribing them. It is said that he resolves these intricate questions with the greatest ease, and scarcely ever takes his eyes for a moment from the other children of the gymnasium, who are playing around him. One of these problems is perhaps worth stating, on account of its complexity. It was as follows:—

—A certain number of poods of sugar were purchased for 500 rubles; if three poods more had been bought for the same sum, it would happen that each pood would have cost 3 rubles less. The question then is, how many poods were purchased? On this being proposed, the boy appeared a little embarrassed. He balanced one of his feet on the other, and turning his head aside, remained without moving for the space of seventeen minutes. He then replied, "twenty poods." Astonished at the accuracy of the answer, the examiner asked him how he had arrived at this conclusion, but he could extract *no satisfactory information* from the child; but from what he said it appeared that he had arrived at a knowledge of the true number by successive suppositions of numbers. The Emperor of Russia on paying the gymnasium of Kostroma a visit, saw young Petroff, and had him examined in his presence, and after expressing his admiration of his extraordinary faculty, ordered the civil governor to place the sum of 1,000 rubles at interest for the benefit of the boy, and instructed the director of the gymnasium to have him taught to read and write in the Russian, German, and French languages.—*Times.*

NOTES AND NOTICES.

The Canadian Twin Steam-Boat.—A correspondent of the Nautical Magazine, speaking of the large twin steam-boat built at Prescott, in Upper Canada, and described in our pages (No. 578). says:—"This vessel was intended to run between the Cedars and Prescott, a distance of 100 miles; and from her very light draft of water, only 32 inches, and very light construction, it was confidently expected that she would have overcome the rapids between these two places without difficulty. I am, however, very sorry to acquaint you, that not only those interested, but the public at large, have been greatly disappointed at the failure of this grand, and much talked-of experiment; her speed on her trial not justifying the owners in making the hazardous attempt. I am, notwithstanding, fully persuaded that they will be successfully navigated in the course of two or three years. I take it that there is something radically defective with respect to these double or cylinder boats, so far as speed is concerned, from the very circumstance of being obliged to propel four sides and two bottoms through the water, besides the concussion of the water between the two hulls; all these creating too much friction, &c."

An Iron Steam-Boat, the Vulcan, made at Manchester, and intended for the Lake of Zurich, arrived at Coblentz on the 30th of November last. It draws only 26 inches, and the whole vessel, except the deck, is of iron. The bottom plates are half an inch thick. The engine is of high-pressure. It is to be steamed up the Rhine as far as the depth of water will permit, and then taken to pieces and conveyed overland to Zurich.

There is at Dover, on the western heights, a tank for water, capable of receiving more than 90,000 gallons, and, if I am rightly informed, often actually retaining that quantity. This tank receives the rain-water, which descends through subterranean channels, from some of the military works on still higher ground: the water on entering the tank passes first through a course of large shingles, and then through a wall or deep bed of sand, and thus becomes filtered and purified. The water, which is thus rendered of most excellent quality, would serve a garrison for some months. If some of the valuable correspondents of the Mech. Mag. could furnish a correct account of this structure, with a plan and elevation, and an adequate description of the mode of collecting and transmitting the water from the higher ground, the communication would not merely be interesting, but might be useful in suggesting the mode of erecting similar tanks for preserving and purifying rain-water in other places.—*G. Y., December 2, 1834.*

New Ball Projector—A French agriculturist, of the name of Billot, who has assiduously cultivated the mechanical arts, has invented a machine

which will discharge 2,000 balls, each 8 ounces in weight, per minute, or 120,000 in an hour, and this without the slightest intermission. The action of this formidable machine may be arrested or continued at will; the balls are discharged from four different muzzles, which may be directed upon objects at a less or greater distance from each other, or they may be brought to bear simultaneously on one and the same point. Billot's machine, however, is not capable of carrying such balls a greater distance than 100 metres (about 110 yards); but he asserts that he can improve it, so as to impel the same balls a distance of 450 yards, and with a velocity scarcely inferior to that imparted by gunpowder. In this case, he adds, that he will be obliged to increase its weight from 80 to 310 lbs. He does not employ either air, spring, or combustible matter in this new projectile; and his name is of some note among French mechanics as the inventor of two new levers, which are to be seen in the collection of the "Société d'Encouragement" at Paris.—*United Service Journal for December.*

Late Celestial Phenomenon.—A correspondent of the *Norwich Mercury*, in making some remarks on the phenomenon seen at Liverpool on the night of the 3d of Nov., as stated in our Journal of the 15th Nov. following, says:—"Six years ago a phenomenon was seen in nearly the same position on the 29th of September, about the same time in the evening, and which disappeared in a similar manner, by gradually losing its splendour; and what is remarkable, in both nights there was a considerable display of the aurora borealis, but yet neither of these western lucid streaks could have proceeded from a similar cause with the northern lights, because the sides of the streaks in both cases were not parallel, and the line through their middle was curved, and in both cases concave towards the north. Both these western visiters were in substance similar to a comet's tail."

Marine Artificial Horizon.—Lieutenant A. B. Becher has, we are informed, succeeded in producing this desideratum, by a machine of simple construction, and of small size. It is founded on the principle, that the same fluid (in this case mercury) preserves its level when distributed in different tubes; and the experiment has been found to answer when tried in the North Seas by day, by Captain Hewett of the Fairy.—*Literary Gazette.*

Fairy Circles.—A Norwich correspondent states, that in the Norwich cricket-ground, there are thirty or forty fairy circles to be seen, some of them in the form of a figure 8. He is of the opinion generally entertained, that lightning is the cause of this phenomenon.

Sailing Railway Waggon.—A coal-waggon was rigged with a mast and sail by Captain Hurst, of the Emperor Alexander, and was placed on the Llangennech Coal Company's railway at Lanuelly dock. The wind blowing strong in the direction of the railway, the waggon was propelled up an inclined plane, half a mile long, to St. David's Pit—the whole distance being 3 miles, which was performed in 7½ minutes—at about the rate of 25 miles an hour. On a subsequent trial, when the wind was blowing on the side of the waggon, it was propelled at the rate of 9 or 10 miles an hour. —*True Sun.*

Calculating Machine.—A man named Louis Torchi, a Milanese, cabinet-maker, is stated to have constructed a machine which performs the three first rules of arithmetic.

Cultivation of Tobacco in Russia.—The Russian government has awarded a gold medal to Conrad *Staffa, colonist of Catharinestadt*, in Saratoff, for *having succeeded in promoting* the culture of American tobacco in the four colonies of Reasnowke, Lucerne, Zug, and Soleure. In six years the produce was 16,355 poods, which, at the mean price of seven rubles a pood, produced 114,485 rubles.

The Royal Society Anniversary was held on the 1st inst., when the first of the Society's medals was conferred on Mr. Lubbock, the vice-president, for his investigations into the tides (! ! !); the second on Mr. G. Lyell, for his geological researches; and the third on Signor Planna for his astronomical observations.

Bread from Wood.—Dr. Prout has clearly proved that all the chief alimentary matters employed by man may be reduced to three classes, viz. saccharine, oily, and albuminous substances, the most perfect specimens of which are respectively sugar, butter, and white of egg. The saccharine principle, in its extended sense, includes all those substances which are chiefly derived from the vegetable kingdom; means, in fact, the same thing as what we commonly call vegetable diet. It comprehends all those substances, whatever their sensible properties may be, into the composition of which hydrogen and oxygen enter in the proportion in which they form water; for example, the fibre of wood, which chemists call *lignin*. Much skilful manipulation and delicacy of experiment were required to establish this result; but the nutritive property of the woody fibre—in short, that a tolerably good quartern loaf can be made out of a deal-board—has been proved by the recent labours of a German professor, and may be verified by any one who will take the trouble to repeat them. The following, says Dr. Prout, was the method he employed for this purpose:—In the first place, every thing that was soluble in water was removed by maceration and boiling; the wood was then reduced to a minute state of division, not merely into fine fibres, but actual powder; and after being repeatedly subjected to the heat of an oven, was ground in the usual manner of corn. Wood thus prepared, according to the author, acquires the smell and taste of corn flour. It is, however, never quite white, but always of a yellowish colour. It also agrees with corn flour in this respect, that it does not ferment without the addition of leaven, and in this case sour leaven of corn flour is found to answer best. With this it makes a perfectly uniform and spongy bread; and when it is thoroughly baked, and has much crust, it has a much better taste than what, in times of scarcity, is prepared from bran and husks of corn. Wood flour also, boiled in water, forms a thick, tough, trembling jelly, like that of wheat starch, and which is very nutritious. The nutritious properties were first tried on a young dog; afterwards he fed two pigs upon it; and then taking courage from the success of the experiment, the professor attacked it himself. His family party, he says, ate it in the form of gruels or soup, dumplings, and pancakes, all made with as little of any other ingredient as possible; and they found them palatable and quite wholesome.

Communications received from Mr. Murray—Mr. Wharton—Mr. W. G. Pearson—G. L. S.—Mr. Pritchard—R. R. J.

The Supplement to Vol. XXI., with a Portrait, on Steel, of the late Mr. Telford, is now ready. Price 6d.; also the Volume complete, in boards, Price 8s.

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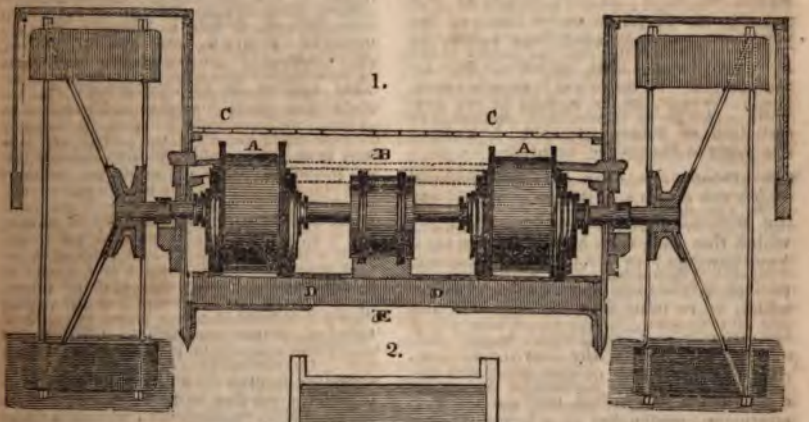
THE EARL OF DUNDONALD'S REVOLVING STEAM-ENGINE.

1.



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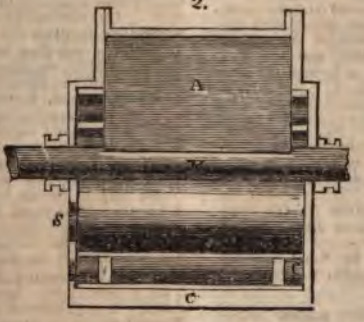

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4.

THE EARL OF DUNDONALD'S REVOLVING STEAM-ENGINE.

The engravings on the preceding page exhibit the construction of a rotary engine, which has been recently patented by the Earl of Dundonald, and the manner of its application to the propulsion of vessels. The Earl himself describes it in a circular, with a copy of which we have been favoured, as surpassing in efficiency every thing of the kind hitherto produced—as being, in fact, so perfect, that perfection can no farther go. "The cause," says his lordship, "of the uniform failure in the construction of rotary engines, has been the great difficulty of obtaining, within the machine, a base of resistance on which the steam might act in propelling the moveable piston. The means by which this has been hitherto attempted, have consisted of a variety of very imperfect mechanical contrivances, all of which have proved quite inadequate to the successful employment of this sort of engine; but in the REVOLVING ENGINE now offered to notice, this great difficulty is *completely overcome*. This engine is constructed on a principle that gives *the most perfect fulcrum* or resisting base, in a manner *that leaves nothing on this head to be desired*—indeed, it is as perfect, and nearly as simple, as the fixed cover or bottom of the cylinder of the ordinary reciprocating engine. The great and paramount difficulty of obtaining a suitable fulcrum being *thus completely overcome*, all other obstacles to the employing of this sort of engine at once dis appear; in truth, from the result of numerous trials, during two years' experience, it may be affirmed that this engine is constructed in such a manner as to render it *equally perfect and efficient as the best reciprocating engine!*" Nor does the perfection of this engine rest on the noble lord's own testimony; for that very ingenious engineer, Mr. Alex. Gordon, in his "Treatise on Elemental Locomotion," 2d edition, 1834, speaks of it in the following *equally encomiastic terms*:—"Of the many rotary engines none have stood the test of long trial; and, indeed, as yet there is none in *practical use*, if we except that of the Earl of Dundonald (the gallant and ingenious Lord Cochrane), which bids *fair to rival the best reciprocating engine.* * * *The cause of uniform* failure of other ingenious persons, in the construction of rotatory engines, has been the difficulty of obtaining, within the machine, a base of resistance on which the steam might act in propelling the moveable piston. The means by which this has hitherto been attempted, have consisted of a variety of very imperfect mechanical contrivances, all of which have proved quite inadequate to the successful employment of this sort of engine; but in the REVOLVING ENGINE now under notice, *this difficulty is completely overcome.* This engine is constructed on a principle, that *gives a perfect fulcrum*, or resisting base; indeed, it is as perfect, and nearly as simple, as the fixed covers, or heads, of the cylinder in ordinary reciprocating engines, &c. &c. The great and paramount difficulty of obtaining a suitable fulcrum having been *thus completely overcome*, all other obstacles to the employing of this sort of engine at once disappear: in truth, from the result of numerous trials, during two years' experience, this engine is constructed in such a manner as to render it *equally perfect and efficient as the best reciprocating engine.*" 'Equally encomiastic terms,'! we think we hear the reader exclaim—'Why they are literally the same terms—his lordship's own words over again.' So, gentle reader, in truth, they are. What Lord Dundonald says, and all he says of his engine, Mr. Alex. Gordon says, and little more; not a tittle of difference is there, in three of the four sentences we have quoted from Mr. Gordon's book, save *just as much* as might serve to make it appear (no quotation marks being used), that Mr. Gordon's words are his own words, and not merely a parrot-like repetition of those of his lordship. But though the identity of the language employed in the two quotations be certainly very singular, it is, after all, but an identity in language, not *necessarily* extending to the matter of the extracts themselves. Mr. Gordon may have felt unable to say what he honestly thought of the engine in question, in better terms than those previously used by the noble inventor himself; and if so, can he be to blame that he made use of the same terms over again? Obviously not. His lordship's patent covers only the engine itself—not the words employed by his lordship to describe its perfections. There could be

no piracy in the case—only *a little convenient appropriation.* But, it may be said, if Mr. Gordon was driven by such a sense of fitness to employ the same words as his lordship's, he might at least have had the candour to acknowledge that they were the same, in order that his readers might be enabled to judge for themselves whether they are actually so *fit*—so peculiarly appropriate—that no person desiring to give a *discriminating, independent, and impartial* opinion of the invention, could employ any better; or whether the identity is but such as might be expected, where a person has lent himself to puff off the pretensions of another, without any care for truth, honour, or reputation. We confess there is something in this; and, therefore, it is that we have done our best to make up for Mr. Gordon's *not* very candid omission. No one—of *our* readers at least—will now be at any loss to determine for himself the degree of weight which belongs to Mr. Gordon's opinion in the present instance.

Mr. Gordon, it will be observed, goes on one material point considerably further than the Earl himself. The Earl speaks only of "numerous trials" of his engine; Mr. Gordon talks of its being "in *practical use;*" and the words are put in the original, as here, in italics, to impress them more forcibly on the minds of the reader. The obvious intention of the phrase used by Mr. Gordon is, to make the public believe that Lord Dundonald's engine has not only had many "trials" by his lordship himself, but has been thought so well of by others—by practical persons, requiring the use of a steam-engine for practical purposes—that they have had engines made on this plan, in preference to reciprocating engines, and are now actually using them with great advantage. But what truth is there in this? What "practical use" can Mr. Gordon specify? Can he name a single vessel—not a "trial" one merely—where a marine engine, on his lordship's plan, is employed? Or refer us to a single mill or manufactory, where a revolving-engine of Lord Dundonald's is employed as the moving power? We are greatly misinformed, if it is in his power to do any thing of the kind.

It is not, certainly, as an engine in "practical use," nor even as one very likely to be so, that we now bring it under the notice of our readers. We think by no means so highly of it as either his lordship or his echo, Mr. Gordon. We give a place to the present description of it in our pages, for two reasons, very distinct from admiration:—first, because of the considerable talk there is about it, owing partly to the celebrity (for other things than machine inventing) of the noble inventor, and partly to his prodigiously confident representations of its amazing capabilities; second, because if we are wrong in the opinion we have formed of it (which not being persons of such infallible stuff as his lordship, nor of such ready faith as Mr. Gordon, we admit to be a possible case)—if it has really left "nothing to be desired," in the way of producing an effective rotary-engine—it were a thousand pities that the knowledge of an invention, calculated to confer so much benefit on the mechanical world, and to save so much trouble and mortification to hundreds of ingenious mechanics, who are now occupied with the solution of that problem, of *which it is said to furnish the best possible practical solution*, should not be as speedily and as widely diffused as possible.

Fig. 1 is a representation, copied from Lord Dundonald's circular, of two engines of this description applied to the propulsion of a vessel. A A are the engines; B the air-pump; C C the deck; D a strong beam on which the engines and air-pump rest; E the space for the boiler. Figs. 2, 3, and 4, are sectional views of one of the engines, exhibiting, under different aspects, the peculiar mode of construction by which Lord D. flatters himself he has "completely overcome" the "great difficulty" in the case. We copy these views from Mr. Gordon's book; and shall copy also from it the following explanatory details:—

"Fig. 2 is a longitudinal section, with the blade or piston A in one part of its course (a lunette space). Fig. 3 is a cross section, showing the blade or piston A. Fig. 4 shows the piston in a different part of the lunette space; F is a fixed centre or axle upon which the piston A turns; the radius sweeps round the inside of the larger circle D D; G is the *mathematical* centre (for there is no axis through the centre of

the inner cylinder C C C, &c.) around which the cylinder C C turns. The piston A works in a ball-cock or stuffing at B; and in traversing the lunette space formed between D D and C C C, is obliged to slide out and in through B. At one time this piston A will have a larger portion protruding from C C C, as in fig. 3; and at another time it will protrude less, as in fig. 5. At one time, in each revolution, A will be at a point where there is no part protruding. The piston *crawls* out of and into the cylinder C C C (through B) constantly. The steam from the boiler is admitted through the hole S, and rushes along the opening Y, in the direction of the small arrow: it cannot escape where the cylinders C and D are in contact, and therefore it forces round the piston A in a contrary direction. The other part of the lunette space *evacuates itself* in the direction of the double arrows. Of course the power of the engine is always varying, because the surface of the piston is always either increasing or diminishing. To compensate for *this* variation, two cylinders are used; the one to be in full activity, while the other is passing the dead point. As the one decreases, the other increases; and thus a continuous and rotatory motion is maintained, which can be applied in every case where the reciprocating engine is used for rotatory purposes."

We cannot say that this description of Mr. Gordon's is very clear, or intelligible; it is, in truth, extremely loose and confused—in some parts, indeed, nonsensical. However, such as it is, we must leave our readers to digest it as they best can. It has all the appearance of being done to order, like the encomiums we before quoted from the same pen; and it would be presumptuous in us to attempt to offer any thing in the way of explanation or emendation. The engravings, at least, are plain enough; and, with their help, the intelligent reader will, we dare say, be able to arrive at a tolerably clear notion of all that is meant by *mathematical centres*, *crawling pistons*, *spaces evacuating themselves*, &c. &c.

Mr. Gordon adds, that "by some recent alterations in the steam-ways, the patentee has been enabled to use two pistons in one cylinder, and thus to save weight to a still greater extent. By this new arrangement, one piston increases in power in proportion as the other diminishes in power."

Supposing the engine to be as efficient as it is represented to be, the following are, according to Lord Dundonal principal advantages to be expecte its adoption:—

"1st. It will not occupy one-sixth the space required for the recipr engine.

"2d. It may be placed so low in a to be quite out of the reach of gun-sh the cylinder may be made shot proof out the slightest disadvantage.

"3d. The revolving engine does quires any valve or slide, consequentl is no waste of steam thereby; nei there any loss, as in the space left top and bottom of the cylinders of cating engines.

"4th. There is much less frictio arises from the sum of all the bear quired to convert the rectilineal forc common engine to circular motion.

"5th. There are no beams, cran rods, connecting rods, parallel motion slide valves, excentries, &c. with thei adjusted joints and bearings; there revolving engine is not liable, even tenth degree, to the accidents and hin of other engines.

"6th. The working of the revolving in a steam-vessel, is much more ple passengers, by the absence of trem occasioned by the alternating of a po mass of moving matter, twice in ever of the engine.

"7th. The revolving engine bei tained within a cylinder, may be co finished and united in the manufacto may be lowered into a vessel, and fewer days than weeks are now req erect and adjust a reciprocating engi

"8th. As the moving parts of the ing engine pursue their course in circles (without stop or hindrance), gine is capable of progressive accel until the work performed equals the of steam on the vacuum, or on th sphere:—an advantage which the cating engine does not possess.

"9th. The revolving engine i pletely under the control of the com of a vessel, without the interventio engineer; simply by connecting a line, from his usual station on de cock, by which he can set the engin stop, or reverse its motion.

"10th. The diminished bulk, weig absence of tremor, add to the capacit ancy, velocity, and durability of ve which the revolving engine is placed.

"11th. This engine can, with equ tude, be constructed to propel the vessel, or the smallest boat; to p ship, weigh the anchor, embark or di

the cargo, and perform the most laborious duties of a crew.

"12th. It is peculiarly adapted to locomotion on land; there being, in the revolving engine, no part requiring to be oiled,* exposed to the adhesion of dust or grit; now, so destructive to the rods, joints, and bearings of locomotive engines.

"13th. The revolving engine, from the solidity of its parts, the simplicity of its construction, and the uniformity of its impulsive action, can be kept in repair at less expense than the reciprocating engine; and, if used for mines or manufactories, an engine-house is not required; a simple shed or covering being sufficient.

"Lastly. One quarter of the capacity of ordinary steam-vessels (or half the engine room) is restored to useful purposes; whilst the vessel can be navigated by the same number of engineers and seamen, and with the same consumption of fuel. Thus the comparative cost of building the *useful* portion of a steam-vessel, and the expenses of all kinds, are diminished one-third; whilst the profit from an increased amount of cargo or passengers (or the facility of proceeding to more distant parts), is in the like ratio augmented."

PERKINS' HEATER—DRY ROT—FLAME—AND DAVY'S SAFETY-LAMP.

Sir,—I am reluctantly compelled, from want of leisure, to embrace a cursory survey of several topics in this letter, and dismiss them for ever.

1. *Mr. Perkins' "Heater."*—Mr. Perkins' uncourteous rejoinder was entirely uncalled for, by any thing said in my letter. I never once mentioned the word "circulation;" and am sorry to say he has entirely failed to convince *me* of the absence of danger. I am usually calm and collected in scenes of peril and experimental enterprise; though Mr. Perkins has presumed to say that, in this case, I am frightened "with a bugbear" (as he elegantly phrases it). Notwithstanding this censure, I shall not easily be persuaded to have any thing to do with Mr. Perkins' "heater." There is much in this extraordinary letter that I would call the mystics and metaphysics of science, and, to a plain man like myself, "hard to be understood." I contended for the necessity of defending the *exterior surface*, and this is frankly admitted—though "Brunswick black" can form but a very *temporary* counter check to the destructive process.

Many an asserted invention, gifted with as lofty pretensions as is this one, so loudly trumpeted forth (though equally problematical with it), has been ushered into the world only to perish. What, for instance, has become of Mr. Perkins' "generator," in its application to the steam-engine, which was vaunted to effect quite a revolution in that notable invention? Mr. Perkins, among other exploits, is pleased to threaten us with the extinction of our open fire-places. I hope, however, notwithstanding these sanguine anticipations, the time is far distant, when we shall be compelled to relinquish that mainspring and mainstay of the salubrity of British dwellings—the cheerful and healthy fireside, and on which so much of our domestic comfort depends—for any adventitious, problematical scheme, however specious and plausible. I have, however, done with Mr. Perkins, and will continue to exercise my own unbiassed judgment.

2. *Dry Rot.*—It will be remembered that, in my reply to Mr. Kyan and his adventurous champion, I expressly stated that Davy had already applied corrosive sublimate as a prophylactic, as mentioned by your correspondent, so that, notwithstanding Mr. Kyan's floundering, this *re-application*, on his part, is merely the *crambe repetita*. Your other correspondent, it appears, abandoned it from its *inefficiency*, and confesses, too, that his health was seriously affected by its employment. Surely these facts corroborate my views, and should call for a prudent caution and inquiry. *Arsenic* will not subserve the purpose, or can be made a substitute, as it has been applied by me to vegetation, without any apparent injury to the plant.

3. *Flame.*—I have been constantly in the habit of employing a piece of cardboard, perforated with orifices, at least three times larger than the wire-gauze meshes, to prove the non-transit of flame, in my public lectures; and have done so

* "The offensive smell, so much complained of in steam-vessels, arising from the decomposition of grease and animal oils, spilt in lubricating the bearings of the numerous parts in motion, may be greatly diminished, and, with care, may be wholly *avoided where the revolving engine is used.*"

ever since 1818, when I first introduced the experiment in the theatre of the Surrey Institution. In that year, too, I there publicly showed the experiments with phosphorus and olefiant gas, as well as with alcohol; so that the "posthumous" claim of Mr. Davies, as claimed by his anonymous friend, *must be resigned.*—See Newton's "Journal of Science and Art," and my "Practical Observations on Flame," &c. pp. 6, 7, &c.

4. *Safety Lamp.*—Dr. E. Turner's statement respecting the assumed circumstances of danger is, if not obscure, rather equivocally expressed. Hydrocarbonate, as fire-damp, is providentially almost, if not altogether, the least inflammable among the gases, requiring a *white heat*, accompanied with considerable surface, or actual flame, for its combustion. I have had the safety-lamp *red hot* more than once in the mine; and often exhibit it in my lectures sustained red hot for a length of time in an explosive atmosphere. I am positively assured, by superintendents of collieries, that the workmen frequently work under circumstances where the lamp continues *red hot.* In such cases, where the lamp is stationary, or the atmosphere quiescent, the danger proceeds *entirely* from the *particles of coal-dust*, and which being blown against the red-hot cage, are raised to incandescence and flame, and become the cause of explosion.

Respectfully taking my leave of all these topics, and tendering you my grateful acknowledgments for the space you have been pleased to assign me in your pages, I have the honour to be,

Sir,

Your obliged and obedient

Humble servant,

J. MURRAY.

Dec. 8, 1834.

ON THE DRY ROT.

Sir,—I beg to be allowed to make a few observations in your Journal on this subject; for, as Mr. J. Murray justly observes, the question is very serious. As regards Mr. Kyan's remedy, there is, first, its very great expense, considering not only the present price of quicksilver, but that *in case of war, when ship*-building would be much more active than it is now, the price would be perhaps more than 200 or 300 per cent. dearer. Passing this over, however, we come to the more important inquiry—Can its application in this way prove, *possibly*, injurious? (Mere *probability* is out of the question.) I feel satisfied that every one who knows what muriate of mercury is, will consider it very likely to be so. I have no doubt that if a stream of electricity were directed through the timbers of a ship saturated by Mr. Kyan's process, the quicksilver would be speedily disengaged, and transferred from the veins and fibres of the wood to the bones and sinews of the crew. Now it is well known, at least generally believed, that sudden electric currents have been the cause of the loss of many ships at sea; and the liability of vessels to such an influence ought alone, if no other objection existed, to forbid the use of Mr. Kyan's remedy. There are less expensive, less dangerous, and by far more tangible, remedies, which may be employed. It would be well, however, before applying any of them, that we knew perfectly the cause and nature of the disease to be cured. It is worthy of observation, that dry rot arises spontaneously in some timber, whether exposed to the air or not, but always more rapidly when the wood is not under the influence of the open air. It is also remarkable, that timber is more or less susceptible of dry rot by being in contact with diseased timber, unless protected by some antidote. As regards the cause, I feel satisfied that it arises solely from the timber being destitute of its natural viscous fluid, which contains always an acrid principle. This fluid or sap, in all deciduous trees, descends from the body of the tree in the autumn to the roots, and does not again circulate or rise till spring returns. The spring time, therefore, when the leaves begin to expand, or the autumn, before they fall, I consider the most judicious periods for cutting down timber for service. But it is too often the case in America, and other parts, that because winter is the most leisure time for clearing land, that is the only period when the axe is heard in the woods. Instead of the timber being saturated with its natural preservative, it is thus deprived of it. Let us therefore try to imitate nature in our search for a remedy,

d of rubbing the timber with a rial, as if to saturate it, which is xpensive and, doubtless, dangerous. nost efficacious remedy I consider this:—Dissolve about 2 lbs. of yel- sin in a gallon of spirit of turpen- and when quite hot, brush the r over when planed up for use. ience has shown that this applica- rill completely preserve the timber rom dry rot and from insects.

I am, &c.

J. L. S.

, Dec. 10, 1834.

LONDON BRIDGES.

o, that is familiar with London, ıt frequently experienced consider- nterruption, nay annoyance, when ıg any of the three great thorough- ıver the Thames—London, Black- and Westminster-bridges—from ery crowded state of the narrow ys?

lessen, if not wholly remove the enience, it is proposed to *project* path of a sufficient width on each each bridge (outside of the para- to be formed *of wrought-iron of an ental character*, so as not to impair eneral architectural character of ructure. By this means a *double th* would be obtained on each side bridge; and at each end of these ınal accommodations a gate, some- imilar to those at Waterloo-bridge, be fixed, opening one way *only*; ıich much of the confusion now ıned, by persons passing contrary ın the same side, would be avoided, h of the additional footpaths would n used by persons going in the lirection only.

ıoth Blackfriars and Westminster- s are at this moment under repair, ıoped that the proper authorities ot allow the present opportunity s without doing something of the ıere proposed for the convenience public.

A.

TARY WHEEL-WORK CALCULATIONS.

—For some considerable length of have been *out* of the way of *a regular supply of* your valua- ble and widely-diffused Magazine, and had not seen a number of it for several months, when, on my arrival here to- day, I was put in possession of No. 587, for the purpose of noticing the communication subscribed by William Forres- ter, Kirkcaldy, Fifeshire.

In reply to that communication I may, in the first place, remark, that the wheel- work of the planetarium, described in No. 500 of the Magazine, was no calcu- lation of mine—it was not invented by me. The numbers for the wheel-teeth have been known a long period, as may be seen by turning to "Ferguson's Tables and Tracts," second edition, p. 129; or, probably, any other work which contains a description of planetary machines. The planetarium described in No. 500 of the Magazine, was sent you for in- sertion in compliance with the wishes of different persons, who had solicited me for a section and description of one. It was made entirely of wood, and did not at first contain wheels for the motion of the asteriods, which were added at a subsequent date (partly at my own sug- gestion), from a mean extreme of their periods, collected from several works. With respect to the "*additional tooth*" given to Pallas, the matter arose thus: —A lecturer on astronomy, into whose hands it fell, was displeased at finding two of the asteriods fixed to one hollow axis, and wished it altered. I told him, if it was merely motion that he wished for, he might accomplish his purpose by having simply another wheel for Pallas, with an additional tooth. There was no calculation about the matter. Mr. Fer- guson has been at the pains to make out a table of differences; but he has omitted to say whether it was compiled from the periods of solar or sideral revo- lutions. If mine be from solar, and his from sideral periods, the differences will be very materially altered.

In what the improvement of Mr. Fer- guson's "improved planetarium" con- sists, I am at a loss to perceive. It can- not be in the numbers for the teeth of the wheels, for they were known of old; neither, surely, can it consist in the arrangement of the wheel-work for pro- ducing the periods of Saturn and Her- schel, for this arrangement is old also. Some of his wheels ought "in truth" to have contained one-tenth of "a tooth

additional," for the sake of rectitude! Mr. Ferguson pronounces me to be "ignorant" of "continuous fractions;" but in order to do a little in the way of convincing him of the contrary, I will suppose it required to have a "continuous fraction" of Mercury's period from a solar year. Reduce the hours, minutes, &c. to the decimal of a day; this alone will exhibit something like the fraction $\frac{87.96811}{365.24222}$ days; and these numbers being supposed to stand prime to each other, we obtain the following rule:—Divide the consequent (or numerator) by the antecedent (denominator), and the division by the remainder, and each succeeding division by each succeeding remainder, until nothing remains (as in the common way for the reduction of ratios). Then, for the first term of the first ratio, unity will always be found to be the first antecedent, and the first quotient the first consequent. The second ratio is to be found by multiplying the first antecedent and consequent by the second quotient, adding 0 to the product of the antecedent sign, and 1 to that of the consequent; the sum hence arising will be the value of the second ratio, &c. &c.

87.96811)365.24222(4 first quotient.
351 87244

13 36978)87.96811(6 second quotient.
80.21860

7 74951)1336978(1 third quotient.
774951

562027)774951(1 fourth quotient.
562027

212824)562027(2 fifth quotient.
425648

136379)212824(1 sixth quotient.
136379

76445)136379(1 seventh quotient, &c.
76445

&c. &c. &c.

The above are a few of the quotients arising from the decomposition of the first fraction; these being collated, we have then only to work as follows, as the rule directs:—

Quotients.				Ratios.	
4	× 0 +	$\frac{1}{0}$	=	$\frac{4}{1}$	first ratio (or continuous fraction).
$\frac{1}{4}$	× 6 +	$\frac{0}{1}$	=	$\frac{6}{25}$	second ratio.
$\frac{6}{25}$	× 1 +	$\frac{1}{4}$	=	$\frac{7}{29}$	third ratio.
$\frac{7}{29}$	× 1 +	$\frac{6}{25}$	=	$\frac{13}{54}$	fourth ratio.
13	× 2 +	$\frac{7}{29}$	=	$\frac{33}{137}$	fifth ratio.
$\frac{33}{137}$	× 1 +	$\frac{13}{54}$	=	$\frac{46}{191}$	sixth ratio, &c.

The fractions, or "continuous fractions," will be found on the right-hand side of this table, as marked; and amongst them will be found (in the fourth ratio) $\frac{13}{54}$, the numbers employed by Mr. Ferguson. If, therefore, he found such numbers after the above method, it is not at all likely but that he would have resorted to the same method for all the rest of the wheel-work or fractions; that is, supposing always that he re-calculated them, in order to find if any chance of a possibility existed of "improving (as he says) the works of nature."

At no very distant period I hope to send you a few more illustrations of calculations of astronomical wheel-work. In the mean time, Mr. Editor,

I am, respectfully,

Your most obedient servant,

E. HENDERSON.

Manchester, Dec. 9, 1834.

WATER-SIDE FIRES.

,—In No. 588 of your excellent zine, Mr. Baddeley gives it as his on that a *floating* engine could his plan) be made very useful in se of fires near the river-side; and e not a doubt but he is perfectly t. But it appears to me that *sta-ry* engines would be more useful, ly along the river sides, but through-he metropolis at large, erected at r distances, and in the most conve-places. The distances should be that the water forced by any one nary engine would meet the water n by all the others round it; and ngines should be of such power, they might be worked by men al-kept ready for action. An unin-pted and uninterruptible connexion the water mains of the surrounding ct, or some other sure supply of , with hose at hand to reach the nce required, should, of course, be naintained. In many instances the se of such engines might be greatly reduced, if not entirely saved, by employing them in the intervals to raise water for distilleries, breweries, &c. My idea, in short, is this, that powerful water-engines should be placed at regular intervals all over London, or any other large city. The *co-operative* action of such engines would be most prompt and efficient; fires would be put out before they obtained such destructive power as they ordinarily do, before the moveable fire-engines can be got to work. Even when the engines are got to the fires, there is often no water to be had. The Water Companies and Fire Insurance Companies would perhaps do well to consider the present proposition. I should be very glad to have Mr. Baddeley's opinion of it, or that of any other of your many sensible, practical correspondents — especially those that are acquainted with the localities of London.

I am,
Your obliged servant.
THOS. DEAKIN.

Blaenavon, Dec. 4, 1834.

MR. R. B. COOPER'S PATENT JARS.

,—I have already (at p. 181 of twentieth volume) described Mr. B. Cooper's patent hemispherical ers for closing inkstands, and bot-of all kinds; on the present occa-I wish to call the more particular tion of your readers to the same tiful *contrivance*, as applied to stone-ware jars, for pickles, preserves, &c.

I have had several of these jars in use for some time past, and have found them to be the most effectual and convenient article ever designed for the purpose. Perhaps I should have more extensively benefitted your readers —

such as are family men—by explaining at an earlier season, the advantages to be obtained by the employment of Mr. Cooper's jars; I preferred, however, waiting until I had fully tried them, and the result of my experience will justify the strongest recommendations.

The accompanying sketch shows a jar closed, in which state it is perfectly air-tight: *a* is an enlarged cover, made of the same material as the jar, and accurately ground on the under side (not seen), to fit the neck of the jar; the cover is attached to the jar by a small brass chain, to prevent misappropriation as the exchange of covers would be likely to destroy the effect, each cover being ground into its respective jar: *b* is an iron cross-bar, with a ring and screw of brass, by means of which the jar is closed; the stopper being placed in its seat, the cross-bar is slipped into two holes in the upper part of the jar, as shown in the above sketch, and the screw is turned till it presses upon the cover, when the joint becomes so perfect, as to be alike impervious to gaseous or liquid substances. The opening and shutting of these jars is but the work of a minute. They are got up in a workmanlike manner, at prices, that not only place them within the reach of all classes of the community, but actually render them, in the course of a season or two, *the cheapest*, as well as the most convenient and effectual thing of the kind.

By placing another ring on the cross-bar a padlock can be applied, which affords a protection against juvenile or other depredators.

I remain, Sir,

Yours respectfully,

WM. BADDELEY.

London, Dec. 4, 1834.

BIRCH'S PATENT AXLETREE AND BOX FOR CARRIAGES.

Sir,—In the article, by "Junius Redivivus," on axletrees and axle-friction (p. 163), he commences by saying that his attention of late has been much directed to that subject. This being the case, I am surprised that he does *not clearly comprehend* the improvements effected in that branch of mechanics. In speaking of the axle patented by Mr. Birch, "Junius" says that he considers* it a very imperfect one, in consequence of the single nut not being susceptible of being screwed firm without jamming the wheel fast. He forgets that the outer end of the nut is hexagonal, and consequently cut into six parts, so that the wheel may be adjusted to a nicety, by putting in the linch-pin at $\frac{1}{6}$, $\frac{1}{3}$, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{5}{6}$, or one whole turn round of the nut; besides, the double nuts have been considered by mechanics as superfluous; while the verdigris from the gun-metal or brass, of which they are composed (instead of iron), causes the liquid oil to become a paste.

"Junius" says, in speaking of Mr. Birch's axle:—"The plan of coning the front of the nut against the box is not a good one, because the accuracy of the fitting depends on the accuracy of the male and female screws." And again:—"To cut these threads so true as to insure the cone working true in turning round, would require time, tools, and workmen, far too expensive for an axletree-maker's use." Surely, from this, the writer cannot have thoroughly examined the construction of the axle in question, because the male and female screws are not in the conical parts; neither the convex end of the nut, nor the concave end of the box, which the nut comes against, have screw-threads cut in them; and "Junius" must be aware that one object of coning the nut, &c. is to prevent the greater friction, and the noise occasioned by the air dispersing when two perfectly flat surfaces are opposed to each other.

"Junius" grants the "solitary advantage" of the two cylindrical barrels. Now this is all that Mr. Birch claims the merit of—herein consists the value of the improvement. The advantage of these barrels is most apparent when the wheel gets off the level or inclined plane, that is, into a hole in a bad road; then the barrels, which at other times are still, revolve and assist the action of the wheel.

* The Academy of Industry and Manufactures, &c., Paris, who have just elected Mr. Birch a member, in consequence of his patent axle, *consider* differently; as well as the proprietors of seventeen carriages, which Mr. B. has already fitted up with his improved axletree.

tle-arm having these cylindrical , must assuredly have a double age over any other, because, if it or particle of silex gets between n and the barrels, so as to make er stick fast, then the box will round; and if any grit or particle x gets between the barrels and as to make the former stick fast, ney will still revolve on the arm. Junius" thinks that this desirable age will be counterbalanced by onsiderable extra weight of these . Will he believe that the axle- ken out of the cabriolet before ad- to, weighed 14 lbs. more than the axletree that supplanted it? ther advantage of Mr. Birch's axle- that the groove cut in it to allow ssage of oil is longitudinally; s it has been frequently known e transverse incisions in other axle- ave occasioned their breaking. wheel of Mr. Birch's gig, which once oiled, was never again dis- until worn out, was running at le of from ten to fifteen miles a r one year and a half, at the ave- eed of eight miles an hour. gentleman of whom "Junius" ho is he, "that faith should be his quoted opinion," is, I believe, ledged by scientific men to be ant with mechanics. itting that the cabriolet was only nally in use for two years and a t at the end of that period the oil nd to be in a perfect and liquid and it did not require mechanical any one to certify that the box, pened, was *quite* full of oil—no, uite" full—minus friction (I thank 'Junius," for teaching us that adth-nicety), nor yet that the oil come glutinous, which it would en by metal nuts. Junius" considers the testimony in of Mr. Birch's axle mere verbiage, parently depreciates it, in order the merits of Mr. Collinge's patent; Mr. Birch has no wish to uphold vention, unless its merits are satis- y proved, he offers to present an any stage-coach proprietor, say the e, on which there is the greatest provided Mr. Collinge will pre- nother; *then let their respective e decided by the public.*

t, however, from the enlarged mind of an individual like "Junius," that his remarks were occasioned more by a desire to come at truth than any thing else, and that he has no connexion with certain parties who, from interested motives, desire to retard the progress of an invention that has been too favourably received to be stopped—an invention which, for the present, alike defies their power at competition and their malice; therefore, as he has yet much to learn respecting the advantage of Mr. Birch's patent axle, by calling on the inventor he shall receive every instruction in that respect.

I am, Sir,

Yours respectfully,

A BIRCH ROD.

London, Dec. 11, 1834.

EXPLOSIVE FORCE OF DETONATING POWDER.

Sir,—A few evenings back I tried, with a friend, the explosive power of percussion caps, with a fowling-piece, and was extremely surprised at the result. The flame of a large candle was put out at nine feet distance from the mouth of the gun, and was much disturbed at 14 or 15 feet distance. I do not suppose the copper caps contain more than ¼ of a grain each of the detonating powder; which small quantity generates, it appears, sufficient gas to displace the air not only contained in the gun-barrel, but also an horizontal column of the diameter of the barrel nine feet in length. Upon my placing my hand immediately behind the candle, the effect of the explosion felt similar to a puff of wind from the mouth upon a small spot. Although I did not then try the quantity of gunpowder required to produce the same effect, I have no doubt but the detonating powder thus used is upwards of 200 times stronger than gunpowder, which is as ¼ of a grain to 1 drachm Troy; and independently of this great superiority in generating gas, it appears to be much more rapidly susceptible of perfect explosion.

I am induced, from these circumstances, to think a great advantage would be gained, for many purposes, by mixing the detonating powder, which is, I suppose, a precipitated nitrate of silver, with gunpowder, particularly in charging

shells, and even for general purposes in different proportions; as, besides the additional strength, the internal surface of guns would, no doubt, become foul in a much less degree. A much cheaper preparation, and nearly as powerful, can be made with quicksilver. The chlorate of potash and antimony form a powerful, but in some proportions a highly dangerous, percussion powder.

Your obedient servant,

J. L. S.

Enfield, Dec. 8, 1834.

THE CIRCULATION IN ANIMALS AND PLANTS.

We extract the following useful enumeration of all the *microscopic* objects in the animal and vegetable kingdoms, in which a vital circulation has been hitherto observed, from a new work which Mr. Pritchard, the eminent cultivator of this branch of science, has in the press, entitled, "List of Microscopic Objects:"

"The most interesting active phenomenon exhibited by the microscope is the circulation of the nutritious fluids in animals and plants. In the former, the globules of blood may be seen passing rapidly along the capillary ends of the arteries into those of the veins, when the intervening membrane is sufficiently diaphonous, as in the ear of the young mouse; the fins and tail of the carp, gold fish, stickleback, tadpole, and of most small fish; and in the web between the toes of the frog, lizard, eft, &c. For these purposes, a magnifying power from 100 to 250 times linear is sufficient.

"In the arachnoida (spider tribe), at the joints of the legs, I have observed the circulation very distinct, the current of dark globules passing rapidly at each pulsation of the dorsal vessel. In the antennæ and wings of terrestrial insects, it has also been seen when they have just emerged from the chrysallis, as in the peria viridis and semblis bilineata. In several aquatic larvæ and small crustacea, the circulating fluid traverses the limbs, antennæ, and tail, and thence moves along the dorsal vessel towards the head, and down the sides of the body in cavities, and not distinct vessels, hence called *diffused* circulation. The most favourable subjects for viewing this are the following, the first six of which are drawn and described in the *Microscopic Illustrations and Cabinet*:—Larva of the *ephemera (the recent discovery of the beautiful mechanism of the dorsal vessel of this larva, by Mr. Bowerbank,* is fully confirmed by the careful dissections of Mr. Newport, who, with much perseverance, has extended these inquiries to the other states of insects —see *Roget's Physiology*); larva of hydrophilus, small disticus, agrion puella (in this elegant larva, I have not observed the circulation in the legs extend beyond the haunches); libellula, round lynceus, fresh-water shrimp, water hog (oniscus); ligia, water flea (daphnia pulex), &c. Power from 100 to 250 times linear.

"In several of the polypiferous zoophytes, as the tubularia indivisa, sertulariæ, campanulariæ, plumulariæ, &c., Mr. Lister has, by means of the achromatic engiscope, discovered a circulation to exist, which in many respects resembles that in plants.—See *Phil: Trans.*

"The circulation in plants, termed *cyclosis*, is a revolution of the fluid contained in each cellulle, and is distinct from those surrounding it. It can be observed in all plants in which the circulating fluid contains particles of a different refractive power or intensity, and the cellules of sufficient size and transparency. Hence all lactescent plants, or those having a milky juice, with the other conditions, exhibit this phenomenon. The following aquatic plants are generally transparent enough to show the circulation in every part of them:—Nitelli hyalina, nitella translucent, chara vulgaris, and caulinia frigalis. In the frog-bit (hydrocharis) it is best seen in the stipulæ of the leaves and the ends of the roots. The magnifying powers suited for the above are between 100 and 250 times linear. In the spider-wort (tradescantia virginia) it is seen in the filaments surrounding the stamens of the flower: power 300 to 500 times linear. In the common groundsel (senecio vulgaris) it is said to be seen in the hairs surrounding the stalks and flowers."

RECENT AMERICAN PATENTS.

(Selected from the Franklin Journal for Oct. 1834.)

COLOURING LAMP OIL OF DIFFERENT TINTS—*Ezra Bourne, New York.*—To render the oil red, alkanet root is to be put into it, and to remain until the colour is sufficiently deep. For green, verdigris is to be used, grinding it, and allowing it to be rubbed up with a portion of oil; this may be poured into a cask, and the oil eventually strained. Cinnamon and cloves are to be used for a cinnamon colour, the colouring matter being extracted by a mixture of oil and spirits of turpentine. A deeper colour may be obtained by oil of pimento.

The foregoing contains the whole substance of the specification, the modes of

colouring not being claimed. From our brass lamps we could have supplied to the patentee a green colouring matter, which we have often thrown away; the colouring of oils by alkanet root has been done thousands of times, and, for ourselves, we had rather use the cloves and cinnamon for other purposes. We can assure the patentee, that an easy mode of depriving oil of all colour, would be an invention much more likely to please the public than that for communicating colour thereto.

VENTILATION OF VESSELS—*Russel Jarvis, Boston.*—We are informed, that "this invention or improvement consists in expelling or drawing foul air, humidity, and every kind of noxious vapour from the vessel, and introducing, or injecting, at the same time, fresh air into the same vessel, without introducing water," &c. &c. The means proposed is the employment of condensing and exhausting pumps, to draw the foul air from the vessel, and introduce that which is fresh. It is proposed to place tubes leading down the masts into the hold, the masts being grooved to receive them, to prevent their interfering with its rotundity. Nothing peculiar is claimed in the construction of the pumps, or in the kind of machinery by which they are to be worked, the plans given being considered as mere exemplifications of the general principle.

The patentee expressly says, "I do not claim as a new invention the pumps above mentioned, nor the engine above described. What I claim as new, and as my own invention, is the application of pipes, pumps, and wheel-work, or other moving power, as above described. Or of pipes alone, fixtures in the vessel, as above described, to the ventilation of every kind of vessels."

He does not appear to be aware of what has already been done and published upon the subject, or he would have known that his claim was essentially defective. As to that part in which he proposes merely to fix tubes through which foul air may escape, and others through which fresh air may enter, we view it as so entirely inadequate, and so inferior to the ordinary wind-sails, that we shall not attempt to discuss its merits. With respect to the pumps for blowing and exhausting, we might refer to many other sources of information; but under the article VENTILATION, in Rees' Cyclopædia, enough will be found to convince any one that what was done upon the subject by Dr. Hales, as far back as the year 1741, would throw the present plan into the shade. There the whole arrangement is clearly and distinctly shown, whilst the specification before us leaves the thing claimed uncertain and *obscure, in* most of *its points, and would enable the* patentee should he see one of Dr. Hales' ventilators at work, to say, "that is an invasion of my right."

VERTICAL WOOL-SPINNER—*Wm. Sykes and George M. Conradt, Fredericktown, Maryland.*—The novelty claimed in this machine consists in the mode of drawing the thread. The slubbing is put on to a roller in the usual way, and is conducted down to the spindles on the lower part of the machine; in descending, it passes between two segment-rollers, that is, rollers which have opposite sides flattened, so as to remove about half of their touching surface; the roving in descending is embraced, alternately, between the two cylindrical parts. Similar rollers are placed a few inches below these, embracing the thread at the time it is free in the upper rollers; "and thus the operation of a continued drawing is performed, and at the same time the flyers give it the requisite twist. If hard-twisted yarn is required, the pairs of rollers are placed nearer together; for loose yarn, further apart." The claim is confined to this part of the structure.

IMPROVED BOOK-BINDERS' CUTTING-MACHINE—*Joseph Bateman, Harvard.*—The machine here patented is clearly described in the specification, well represented in the drawing, and has the merit of differing essentially from those previously patented for the same object. The body of the machine consists of three parallel bars, which may be eight feet long, and six inches square, placed horizontally, one above the other, and supported at suitable distances apart by end cheeks, bolts, &c. The lower bar forms the bed upon which the paper to be cut is placed; the middle bar is the follower, which is forced down by screws, and presses the paper, or books to be cut, and the upper bar serves for the pressing-screws to work in.

A sliding-bar in front of the press has in it eight knives, placed a foot apart; they are in form like the ordinary book-binders' cutting knife, and are fixed in the sliding-bar in such a way as to admit of their being properly adjusted, and the bar itself is so confined that whilst it slides freely, it cannot swerve from its proper direction. A fly-wheel and crank, connected to the sliding-bar by a reach, or pitman, gives to it the proper vibrating motion. The different adjustments we do not attempt to give, as these would require the whole specification. The claim is to "the simultaneous use of so many knives, brought to bear upon the books or paper to be cut, or trimmed, by turning the balance-wheel, and the consequent operation of the weights, shafts, screws, and springs, above described."

METALLIC-FRAME HAT-BLOCK — *Norris S. Canfield, Wilton.*—The object of this improvement is to form a hat-block which shall admit of a free access of the dying-liquor, and of air, in the operation of dying. A cylinder of wood, 2 or 3 inches in diameter, and a little longer than the crown of the hat, is to have wire, or strips of copper, or other suitable metal, attached to it in such a way that they may form a round cage, or reel-like apparatus, with the cylinder in the centre. Upon this the hat is to be placed when submitted to the action of the dye stuff, this operation being performed in the usual way. "The principle of this improvement consists in the mode of constructing a frame hat-block of wire, or strips of copper, or other metal, fixed in the ends of the piece of wood, by the ends thereof, and in sufficient numbers to support the crown in shape."

MACHINE FOR SHOULDERING BAGS OF GRAIN OR FLOUR—*John Kinman, Hartley.*—An upright post is to be fixed in the floor, its lower end being rounded, and passing into a socket to allow it to turn round. A sliding-box, having a bottom or shelf, upon which to place the bag, and a back and sides to sustain it, slides up and down upon this post, by means of a socket or box, behind that which holds the bag. Upon the post there is a rack, into which a pall, or catch, falls, so as to hold the box at any height to which it is raised. A tackle, or other apparatus, may be used to raise the box and bag to a suitable height for shouldering, when, on removing the catch, the box will again slide down to the bottom of the post.

EXTRICATING HORSES FROM CARRIAGES —*O. R. Broyles, South Carolina.*—In this apparatus the windlasses to which the leathers of the swingletrees are attached, are made capable of revolving so as to present their reversed side to the horses, and so constructed as the swingletrees will, in that case, be detached, and the horses liberated. They are ordinarily held in their places by two levers, connected together by a rope at their extreme ends, but according to the present mode, their connexion is destroyed, and the horses freed by pulling a line which passes from them to the carriage. The plan appears to be relied on as altogether new, no claim being made to any part of it. The particular arrangement described may probably be original, but there are others bearing some analogy to it, equally simple, and operating equally well, which have been introduced, but have never gone into extended use. The fact is, that whilst we laugh at the sailor who objects to a cork jacket, or *other life-preserver,* because he is apprehensive that it may invite the catastrope against which it is to guard, most of us neglect those precautions that are intended to protect us against *possible* danger only.

PERCUSSION PISTOL-WHIP — *Joshua Shaw, Philadelphia.*—A percussion-pistol is to be contained in the handle of a riding-whip, the construction of it not differing materially from some of the pistols or rifles contained in canes. The thong is fastened to the end of a ferrule that is attached to the whip-handle by a bayonet-lock, and is to be removed before firing. The percussion-cap stands immediately behind the pistol, and the charge is ignited through its centre. The pistol is cocked by drawing back a rod, which passes through the centre of the handle, and has a small button projecting at its head; and the depression of a small knob at the side effects the discharge.

DOUBLE POWER REACTION WHEEL—*William M. Eldridge, Philadelphia.*—This is a very promising wheel, as the specification sets out with the information that it is "to give double power with the same water." Should this be correct, we see no reason whatever for stopping at a double power, the same principle being applicable to any extent.

A reaction wheel of the ordinary construction, with the penstock as usual, is first to be constructed; this wheel is to be surrounded by another, the inner diameter of which is such as to enable it to pass over the first, touching it as nearly as may be. From this outer wheel arms may extend underneath the inner one, the shaft of which is made hollow, to receive that of the outer wheel. The water is to be admitted into the inner wheel at its lower side. The patentee says, "What I claim as my improvement or discovery, is the combining the powers of the two wheels, by applying the outer wheel to the circumference of the inner wheel, so as to receive the water as it is discharged from said inner or reaction wheel, which in common reaction wheels now used falls useless."

Should the water from the first wheel have any power to turn the second, this would simply prove that the first was badly constructed; and the contrivance before us would be much such a remedy for the defect as the placing two nine foot wheels, one below the other, where there was a fall of eighteen feet.

IMPROVED GRIDIRON—*Ami Clark, Berlin, Connecticut.*—This gridiron is to be made round, square, or otherwise, and is to revolve upon its centre, like other revolving gridirons. The bars also are to be fluted, as heretofore, for the purpose of collecting the gravy; but it is to differ from other grid-

uch in the same way in which the
oo differs from other quadrupeds,
, in the relative length of its hind
e legs, in order to give to the gravy the
disposition to descend into the recep-
repared for it. Those cooks who have
ts with legs of equal length, if any
here be, which we very much doubt,
hope, consider themselves as still at
to prop them on one side, in any de-
hich they may find convenient; and
there be in existence such a thing as
ron with fluted bars, a trough for the
and hind legs longer than the fore,
we remember to have seen in those
hen a sop in the pan was accounted a
elicacy, it may continue to stand out
horizontal without obtaining a new

IOVEMENT IN THE STEAM-ENGINE—*iah Allen, Providence.*—The intention improvement proposed in this patent, cutting off the steam at any desired the stroke, so as to allow it to work lvely during the remainder of it; and e uninformed respecting what has been pon this subject, the specification be- would lead to the conclusion that the ig this was in itself a novelty, whilst rell acquainted with the history of the engine, are aware that it was done by and that at an early period of his ca- ' improvements in the steam-engine. s plans have been devised for effecting ject, and the best engines are now orked.

patentee considers the ordinary action throttle-valve, as operated upon by gulator, to increase or diminish the ofsteam from the boiler to the cylinder, tructive of the power of a considerable 1 of steam, and says that his "improve- onsists in so arranging the apparatus steam-valves as to cause the steam to eely from the boiler to act upon the with its full pressure during a longer ter period, or portion of each respec- roke, instead of wasting ineffectually e of the steam by choking its pas- rough the throttle-valve, which, as its guratively implies, throttles the steam pipe, in its progress from the boiler to gine, in order to destroy a portion of active force." "A portion of the is unprofitably wasted by being *wire-*, as it has been termed, through the cted passage of the throttle-valve," ore to the same effect. We dissent y from this doctrine, being convinced ere is very little, if any, loss of power he prescribed cause, but merely a di- ed quantity expended, the remainder packed in the boiler *for future use. f the advantages of using* steam ex- pansively, results from the accordance of its action with the crank motion, as connected with a reciprocating piston. The stroke is to be gradually stopped, at each end of the cylinder, and the admission of steam during the whole stroke is necessarily wasteful in the extreme. We, however, must leave the discussion of this point, as occupying more space than can be here afforded to it.

The patentee has described and figured a plan for cutting off the steam at different parts of the stroke, but as it appears to be intended as an exemplification of a general principle, he has not claimed it; in this point we thing him incorrect, the principle being old, and the particular plan, we believe, new. The lever which is to open and close the valve of the induction-pipe, is to be operated upon at its extreme end by a cam, the lifting part of which is wedge-shaped, and the lever being capable of bearing on its wide or its narrow end, opens the valve for a longer or a shorter period. The shaft, or axis, of the lever is a screw; and a whirl upon this shaft acted upon by a regulator or governor, causes the lever to traverse upon its shaft, and thus cuts off the steam at an earlier or a later period of the stroke.

CEMENTATION OF SCRAPS OF HORN, SHELL, &c.—*Arad B. Newton, Baltimore.*—This specification describes processes which are well known, and have been long practised; a press also is described, in which a follower is forced down upon a bed-piece by two nuts, acting upon male screws, in the ordinary way. Two pieces of horn, shell, hoof, &c. intended to be united, are fitted together, with their surfaces perfectly clean, and are to be placed in a press or vice, taken out of boiling water; when firmly screwed together, they are to be boiled for fifteen or twenty minutes. Scraps are to be treated in a similar way, but they must be forced into moulds of the form intended to be given to the article. These substances, it is observed, may be united by heat, without the presence of water, but the process by means of the latter is preferred. With all this and much more, we have been acquainted for many years, and when first known to us it was old to the workmen in the materials spoken of. The only article in the specification in which we find any novelty, is the information "that soft water, as rain or other light water, answers both for horns and hoofs; but for whalebone and shell scraps, salt water is found to answer best." Of the correctness of this remark we have but little doubt, and are of opinion that it results from the latter articles requiring more heat than the former; and salt water, when boiling, is at a higher temperature than that which is fresh.

NOTES AND NOTICES.

Great Tom of Lincoln, Redivivus.—The re-casting of this bell was effected on the 15th of November, at the Whitechapel bell foundry. The metal was considered by all present at the operation in the most perfect state of fusion possible, and there is every prospect of the bell proving a good one. The date upon it is March 25, 1835, by which time it is intended that it shall be in Lincoln cathedral.—*Stamford Mercury.*

More Fiery Meteors in America.—In our last volume, p. 11, we gave an account of an extraordinary shower of fiery meteors, which was visible all over the American continent on the 13th of November, 1833. Strange to say, another shower, of precisely *the same* description, was witnessed on *the same* day of the present year; and what is still stranger, this exact recurrence of the phenomenon was predicted by Professor Olmsted, of Yale College: on what grounds, however, does not appear. We quote the following notice on the subject from the *New York Journal of Commerce*:—"Professor Olmsted states, that the presence of the moon permitted only the larger and more splendid meteors to be seen. The number of them, though smaller than that of last year, was much above the common average. They began to be frequent about four minutes past one o'clock, when a fire-ball of unusual splendour blazed forth as a signal. From this period they continued to fall at a pretty uniform rate, until day-light was far advanced. It was estimated that 1,000 fell during the night. Their directions were more remarkable than their number, and afforded more unequivocal evidence of the identity of the phenomenon with that of last year. They appeared, as before, to radiate from a common centre, and that centre was again in the constellation Leo."

Shifting Paddle-Wheels.—"In No. 584 of the Mech. Mag., there is an account of a shifting paddle-wheel, which the describer claims (apparently) as his own invention. On perusing it, I, like others, 'admired it for its simplicity;' but, on the 27th of October, 1834, my instructor called me in and said, 'Have you seen in the Mech. Mag. an account of a shifting paddle-wheel?'—I answered, 'Yes, sir;' and then told him my opinion, which was, and still is, in favour of the folding-wheel. I was much surprised, however, when he opened to me a folio book of drawings, with the date of 1824, and among them I beheld the very shifting-wheel which I had so much admired in the pages of the Mech. Mag. The book to which I allude is 'Marestier's History of the Steam-boats of America,' dated 1824, of which some notice was taken in the Mech. Mag., vol. xvii. p. 421."—MASHDOUD MOHANDEZ, Norwich, November 10, 1834.

The Gulph Stream.—We perceive, from the newspapers, that a bottle has recently been picked up at Southport, containing the following paper:—"Thrown overboard from the packet-ship South America, by the passengers, March, 1833, in the Gulph Stream off Cape Cod, lat. 40.30, long. 68. W. The finder is earnestly requested to publish this in the nearest newspaper to the place where it may be found, to show the currents of the ocean, as well as to oblige the passengers, and to confer a benefit on science." Upon this a correspondent observes:—"It is apparent that this bottle has traversed the whole breadth of the Atlantic Ocean, from America to England—adding another to the numerous proofs which have recently appeared, that the course of the Gulph Stream extends to a much greater distance to the eastward than is usually supposed. I have long been satisfied that navigators are in error in supposing that the Gulph *Stream has lost all force* in and about the longitude of the Azores, as laid down in the Admiralty charts. From this error, I make no doubt, that numbers of the wrecks which annually take place upon the western coast of Ireland are solely to be attributed. A few miles per day, in even the faintest current of the ocean will, to a vessel long detained by contrary winds, make a difference of several degrees of longitude in a voyage from America to Europe. It is well known that, almost in every instance, reckonings, not kept by a chronometer, bring a vessel across the Atlantic to the land in Europe altogether as soon as expected by the navigator. It ought, therefore, to become an established doctrine in navigation, that an allowance should be made for the operation of currents, long after the vessel has left the present determined limits of the Gulph Stream, and by less gradations, to the whole western coast of the North Atlantic Ocean."—*Athenæum.*

Floating Bridge between Portsea and Gosport.—It is intended to establish a communication between the island of Portsea and Gosport by means of a floating bridge, from the Point beach to the opposite shore. It has long been a subject of surprise to visiters, that the distance being only 700 yards, there should not have been constructed a means of conveying with facility, and at a small expense, carriages, horses, &c. to and fro, as the part is well sheltered, and presents no difficulty in itself. The plan which has been adopted in similar situations—as that between Torpoint and Devonport, across the river Tamar, and in the midst of men-of-war in ordinary, and between Saltash and Devonshire, across the river Dart, both of which answer the intended purpose exceedingly well, is most satisfactory as to the practicability and stability of the undertaking. The general idea is, the floating bridge being formed, it will be moved to and fro by a small steam-engine, a chain passing round a barrel, and fastened to each shore, on touching which a platform falls down, and cattle, carriages, and passengers disembark without any delay or impediment. The size of the bridge will preserve it from motion, and being only two feet draught of water, it will present little or no resistance to the incoming or outgoing tide.—*Hants Telegraph.*

Kyan's Cure for the Dry Rot as old as 1705.—"Before the Society of Arts of Paris, 1705, M. Homberg stated, that a person of quality in Provence, not knowing how to preserve inlaid work from the worms destroying it in a few years, as frequently happens in that country, he advised him to steep his inlaid work *in water wherein corrosive sublimate had been mixed, which succeeded very well.*"—R. W. D., Ilfracombe.

The letter of "A Mechanic" contains many excellent suggestions; we shall keep them all in view, and avail ourselves of some of them early in the ensuing year.

Mr. Dickinson. The continuation will oblige.

Communications received from Mr. Harvey—Q. Q.—Enort—F. M.—A Working Mechanic—Mr. Bowser.

The Supplement to Vol. XXI., with a Portrait, on Steel, of the late Mr. Telford, is now ready, Price 6d.; also the Volume complete, in boards, Price 8s.

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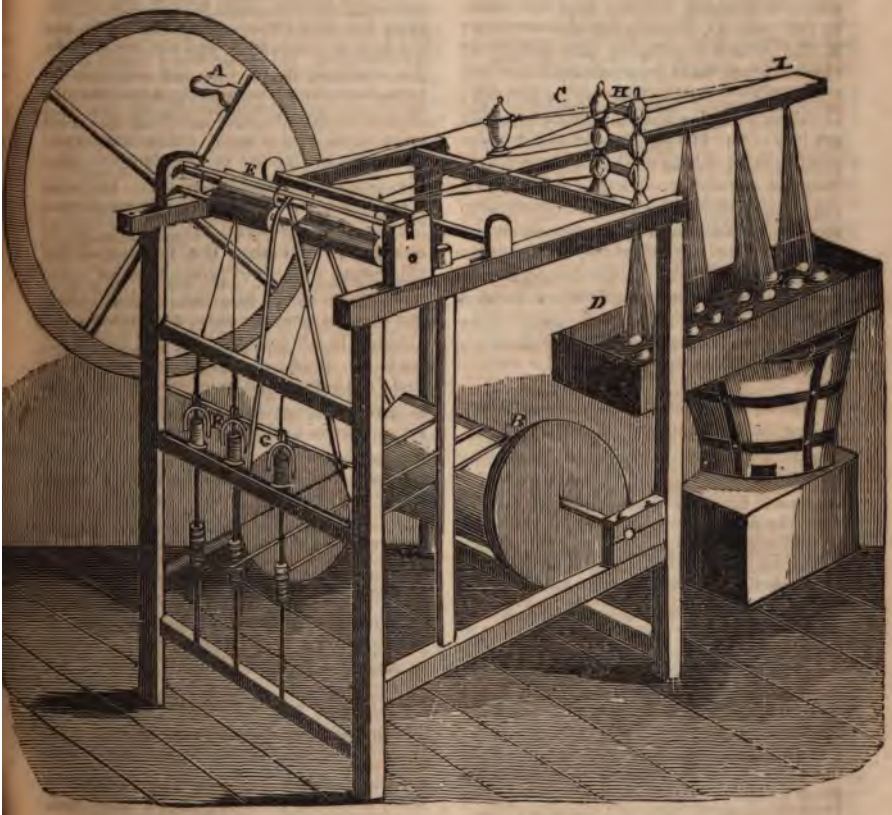
BROOKS'S DOMESTIC SILK-SPINNER.



BROOKS'S DOMESTIC SILK-SPINNER.

(From the New York Farmer.)

The machine, the drawing of which accompanies this article, is the invention of Mr. Adam Brooks, of Scituate, Mass. It is admirably adapted for families where sewing silk is intended to be made. A, is the handle of the crank which gives motion to the machine. There is a band round the large wheel, passing round a small wheel attached to the axis of the cylinder or drum; B is the drum or cylinder, round which the bands giving motion to the spindles pass; C the furnace, for heating to blood heat the water in the pan D, containing the cocoons; E the rollers regulating the supply of thread given to the spindles; F the two spindles for twisting the single threads; G the spindle for the double twisting or sewing silk; H two upright pillars supporting the bobbins containing the single thread to be double-twisted; I a projecting slat, containing the leading wires to receive threads from the cocoons in the pan D. The manufacture, by this machine, of silk for common domestic purposes, is not more difficult than to spin flax or wool, which was formerly done by the females of almost every farmer's family in the country.

CULTIVATION OF SILK IN AMERICA.

(From the American Railroad Journal.)

American Silk. — On the supposition that we have annually imported silk to the amount of four millions of dollars since 1770, when the first filature of silk was established in Philadelphia, the whole amount of this would be 250,000,000. Had this quantity been raised and manufactured in this country, a far greater number of our people would have been employed than has been in the business attending its importation. The following we take from a communication to the *Genessee Farmer*:—

"In 1770 a filature was established in Philadelphia, and premiums commenced.

"In 1771, about 2,300 lbs. were brought there to reel. The ladies, in particular, gave much attention to the subject. As early as 1770, Susanna Wright, of Lancaster county, at Columbia, made a piece of mantua of 60 yards in length from her own cocoons. To give eclat to those colonial designs, the Queen of Great Britain gave her patronage, by deigning to appear in a court dress from this *American silk*. Yes! in American silk; but at the present day, all our silk dresses, *and even our ornaments* for public buildings, must be imported. Grace Fisher, a minister among the Friends, made considerable silk stuff; a piece of hers was presented, by Governor Dickinson, to the celebrated Catherine Macauley. Many ladies, before the revolution, wore dresses of American silk."

(From a Letter by Z. Storrs, of Mansfield, Connecticut, dated Dec. 18, 1833, to the *New York Farmer*.)

With regard to the cultivation of the mulberry, and the growing of silk, in this place (Mansfield), it may not be generally known that the business has been successfully prosecuted here for more than seventy years; but though gradually increasing during this period, there has been but very little improvement in the method of conducting the business, or in the application of the raw material to manufacturing purposes, any farther than the production of sewing silk and twist, and this almost exclusively confined to the labour of the family upon the domestic spinning-wheel. But one thing has been abundantly demonstrated, that is, that the white mulberry is easily cultivated, and that the rearing of the silkworm, and the production of silk, notwithstanding all the particularity, minuteness, and mystery, with which the subject has been treated and invested, may be profitably pursued, with but little more knowledge or care than is requisite for the successful rearing of pigs or poultry. Shelter them from cold, storms, and wind, and feed them when hungry; and whether it be in a cow-house, barn, cider-mill, house or laboratory built on purpose for the business, a profitable crop of silk may be produced.

With regard to the *manufacture* of silk in this country, much has yet to be learned; but I consider the experiment as favourably commenced, and nothing more is wanting than that some of our enterprising and ingenious mechanics should give the subject that attention which its importance demands; and with such improvements in machinery and the art of manufacturing as, I think, the business is susceptible of, we may soon compete in this, as we do in some of our wool and cotton fabrics, with any portion of the world. I believe it to be a well-established fact, that no part of the world now produces a better quality of raw silk than that which is produced in this country. Since the investigation of the subject by a resolution of Congress, and

the encouragement presented by the legislature of this State (Connecticut), in a bounty upon the propagation of the white mulberry, and upon raw silk, the business has received a new impulse. The Piedmont reel has been introduced, and with some improvement in the application of a stop motion, was the last season used to some extent, propelled by water and by horse power, as well as by hand; and our ingenious and industrious females find that, without any further instruction in this branch, they can, with the exercise of a little more patience than the old reel required, produce a much handsomer and more valuable article than by the former method. I have now by me a sample of a few ounces, reeled by one of our ladies, which I think, in every respect, would compete with the production of any country. Thus far, then, I think, we may safely say we *can* and *do* succeed. We have two small silk manufacturing establishments in this town, propelled by water power, in successful operation, at which single thrown silk, organzine tram, and every kind of silk, is prepared with ease, by persons bred to the business. At these establishments all the silk raised in this vicinity, and reeled on the improved reel, as before stated, finds a ready market. Some broad goods have been made, but the business seems not yet to be sufficiently matured to go into the higher branches of manufacture, but must, for a time, be confined to the smaller and more common articles of silk fabrics.

(From the New England Farmer, March, 1834.)

The bill to encourage the cultivation of mulberry trees, and the production of silk, has passed a third reading. This bill gives a bounty of ten dollars for every hundred trees set out at the rate of 600 to the acre, and one dollar for every pound of domestic reeled silk. The consideration of the above bill was attended by a very interesting debate. Mr. Morely communicated much interesting information. He stated that the mulberry tree would grow in any country between 20 and 25 degrees of latitude—that sandy and gravelly soils suited it best—that the required labour could be performed by children—and that 600 lbs. of silk, worth three dollars per lb., could be obtained from the worms fed on the trees which *could be raised from one acre of ground.*

MATHEMATICAL INVESTIGATION OF THE UNDULATING RAILWAY THEORY.*

Sir,—Not seeing your valuable publication regularly, it is only lately that I have been aware of the controversy which has now been carried on for some time among several of your correspondents, on the merits of the undulating rail-road proposed by Mr. Badnall. As that gentleman appears to be much too sanguine in his expectations of advantage from his plan, and conceiving that his arguments had not yet been met in your columns in a manner as clear and satisfactory as might be wished, I had prepared some investigations and remarks on the subject, with an intention of asking a place for them in your pages. Having, however, now received your monthly part for Oct. 1833, containing Mr. Badnall's experiments on the Manchester and Liverpool Railway, I have thought it better to condense my former observations into less compass, so as to leave space for an examination of those experiments, which, I regret to perceive, have only confirmed Mr. Badnall in what I consider his previous erroneous opinions. The delusion (for I cannot call it any thing else,) appears now to have attained that strength, that, unless checked, its effects may be most mischievous, in the endeavour to prevent which I shall be obliged if you can find room for the present communication.

In the first place I shall assume the following data, reserving for the present any discussion as to their accuracy:—

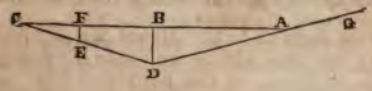
1st, That friction is proportional to the weights, and the same at all velocities.

2d, As a consequent of the first, that the friction on an inclined plane is proportional to the cosine of the angle of inclination.

* The present is one of those papers which we had in reserve when the discussion, which this subject formerly underwent in our pages, was suspended, in consequence of an announcement from Mr. Badnall that certain decisive experiments were about to be made on the Liverpool and Manchester railway, that would make all further discussion superfluous. As a full twelvemonth has elapsed without these experiments being made, (owing, we have reason to believe, to circumstances beyond Mr. Badnall's control), and as they are now, to all appearance, indefinitely postponed, we see no reason for longer withholding any of the communications in our possession that seem calculated to throw light on the subject—more especially so able and elaborate an investigation as that which we here lay before our readers. —Ed, M. M.

3d, I shall leave out of the account the resistance of the atmosphere, as well as Mr. Badnall's "periphfugal force"—of which more hereafter.

Now, in the following diagram, let A B C represent the horizontal length of one undulation, consisting of the two equal inclined planes A D and C D, D B being the perpendicular descent.



Put A B$=a$, B D$=b$, A D$=c$, and the friction on a horizontal plane, when the weight is $1=f$. Then $\frac{b}{c}=$ force of gravity down the plane A D, $\frac{af}{c}=$the friction for that inclination, and, consequently, $\frac{b-af}{c}=$the accelerating force to move the body down the plane. Also, on the plane D C, $\frac{b+af}{c}=$the retarding force opposing the ascent from D. Hence, from the general formulæ, for accelerating and retarding forces, $D=g\,F\,T^2=\frac{V^2}{4\,g\,F}$, where D is the space passed over, F the force, T the time, V the velocity, and $g=16\frac{1}{12}$ feet. Supposing a body to fall from rest at A to D, we obtain $T=\frac{c}{\sqrt{g\,(b-af)}}$, and the velocity acquired at D, $V=2\sqrt{g\,(b-af)}$. Now this velocity will enable the body to ascend the plane D C, say to E, where D E will be found$=\frac{c(b-af)}{b+af}$, and the time of describing this distance $\frac{c}{b+af}\sqrt{\frac{(b-af)}{g}}$; therefore, the whole time from A to E is$=$time down A D$\times\frac{2\,b}{b+af}=\frac{2\,b}{b+af}\times\frac{c}{\sqrt{g\,(b-af)}}$. Of course the average velocity, both down A D and up D E, will be half that at D. If we suppose the carriage, or other body, to *commence its given* velocity at A, we may consider this velocity as having been acquired by falling down a prolongation of the same plane—say from G—and in that case it will arrive at E (the same point as found above) with the velocity acquired at A, and when this is just sufficient to enable it to travel to C, we shall get, in the same manner as before, C D$=$. G D$\times\frac{b-af}{b+af}$; or, A G$=\frac{2\,a\,c\,f}{b-af}$, and D G$=$C $\frac{(b+af)}{b-af}$. Let $v=$the velocity at A, then the velocity at D$=v\frac{\sqrt{G\,D}}{G\,A}=v\sqrt{\frac{(b+af}{2\,af}}$ and the time from G to C $=\frac{4\,b\,c\sqrt{2af}}{v\,(b-af)\sqrt{b+af)}}$, also time down G A$=\frac{4\,a\,c\,f}{v\,(b-af)}$, and, therefore, in this case the time of one undulation from A to C$=\frac{4\,b\,c}{v\,(b-af)}\times\sqrt{\frac{2af}{b\times af}}-\frac{4\,a\,c\,f}{v(b-af)}=\frac{4\,c}{v(b-af)}\times\left(b\sqrt{\frac{2\,a\,f}{b+af}}-af\right)$.

Having made these calculations, we shall now be able to compare the effects, under given circumstances, on the two lines of road.

(1.) Suppose, in the first place, that the carriage commences its descent from rest at A, and we shall find that it will arrive at E by the force of gravity alone; and in order to carry it on to C we must apply a force$=\frac{b+af}{c}$ through the space C E, the mechanical power expended being $\frac{b+af}{c}\times\frac{2\,a\,c\,f}{b+af}=2\,af$; while, in order to reach the same point by the horizontal line in the same time, we must suppose a *uniform* velocity from A to C, equal to the average one on the undulating line, and kept up by a locomotive force equal to the friction, the power expended being A C$\times f=2\,a\,f$, the same as before. The time is, of course, the same on each line, and dependent on the velocity of locomotive ascent from E to C. The question of relative advantage, then, must be resolved by the convenience or economy in practice of applying the *same amount* of locomotive power through the line

A C, and the shorter one E C. This exact case is one unlikely to recur, but will be further considered hereafter.

(2.) In a second example, let us suppose that on both lines a locomotive force, equal to friction (f, and $\frac{af}{c}$) is employed. On the inclined road the time and velocity will be the same as if no friction existed, and the carriage (which would come again to rest at C), moved by the force of gravity alone, the average velocity being half that acquired by falling through the perpendicular line B D. The question in this case is, whether is it better in practice to employ a force f, moving with a uniform velocity through the space $2a$, or a force $\frac{af}{c}$, with a velocity varying from nothing to twice the above uniform velocity, through the space $2c$—the whole amount of power expended being still the same?

(3.) Suppose the carriage to start from A on each line, with a velocity acquired in falling down G A, and just sufficient to bring the carriage to rest at C (which if the case on the one line will also take place on the other), no other force being applied. The *times* in this instance will be found, on the horizontal line $\frac{4a}{v}$, and on the undulating one $\frac{4c}{v(b-af)} \times \left(b\sqrt{\frac{2af}{b+af}} - af\right)$, being in the proportion of 1 to $\frac{c}{a(b-af)} \times \left(b\sqrt{\frac{2af}{b+af}} - af\right)$.

(4.) Suppose the same initial velocity on the undulating line as in (3.), but that on the arrival of the carriage at E, when it will have lost all the velocity *acquired* during the descent from A, a locomotive force is applied $= \frac{b+af}{c}$, so as to keep up this initial velocity to the top of the plane C, and thus enable the carriage to begin the descent of a second undulation, with the same velocity as the first. Here the time from A to E is $\frac{2bc\sqrt{g}}{g(b^2-a^2f^2)}\left(\sqrt{(b+af)}-\sqrt{2af}\right)$, and the time from E to C $= \frac{CE}{v} = \frac{acf}{(b+af)\sqrt{2agf}} = \frac{c\sqrt{2agf}}{2g(b-af)}$, the sum of which $= \frac{c\sqrt{g}}{2g(b^2-a^2f^2)} \times \left(4b\sqrt{(b+af)} - (3b+af)\sqrt{2af}\right)$, the whole time in this case from A to C. Hence $2a$ divided by this time will be the *uniform* velocity to be given on the horizontal line, so that the times shall be equal. Now, in order to render this result more intelligible to general readers we will attach value to the different assumed quantities; say, $a=960$ feet, $b=10$, $f=\frac{1}{240}$ ($9\frac{1}{3}$ lb. per ton), and $g=16$ feet; c may be taken the same as a, without sensible error. We shall obtain, in the cases above supposed:—

(1.) Time from A to D $=40\sqrt{6}=98''$. Velocity at D $=8\sqrt{6}=19\frac{6}{10}$ feet. Also DE $=\frac{1}{7}$ DC $=411\frac{1}{7}$ feet, the time of ascent from D to E being $1\frac{1}{7}\sqrt{6}=40\frac{4}{7}$ seconds. The average velocity from A to E will be $9\frac{4}{7}$ feet per second, and if we suppose the locomotive power from E to C to move with the same average velocity, $9\frac{4}{7}$ feet will be the uniform speed on the horizontal line, so as to arrive at C in the same time.

(2.) Time from A to D = that from D to C, is $24\sqrt{10}=76$ seconds, velocity at D $25\frac{1}{7}$ feet, and the average velocity, being the uniform one on the horizontal line, $12\frac{3}{7}$ feet per second. I need not say that it would be much better to adopt, in this case, the uniform velocity and the horizontal line.

(3.) GA $=1280$ feet, $v=16\sqrt{2}=22\frac{3}{5}$ feet; time on the horizontal line $=120\sqrt{2}=169\frac{7}{8}$ seconds, while the time by the undulating line is only $400\sqrt{\frac{1}{7}} - 80\sqrt{2}=100\frac{3}{8}$ seconds. In this instance, therefore, there is a decided advantage in point of time, and that in proportion (to a certain extent) as the undulations are longer and deeper. It must be observed, however, that this case has not the slightest bearing upon the point in dispute, though it is the results here stated which have given rise to all the fallacious notions on the subject, and the discussions respecting them; for it is evident that we are under no obligation to make the motion on the horizontal

line conform to the variable one on the inclined line—the velocity on the former being, by our very suppositions, uniform throughout; and therefore when we compare lines, as in this instance, we must do so under the *best circumstances for each line*, and as would occur in practice. To place this in a stronger light, suppose a second undulation is to be passed over, we shall then have to obtain *previously* on a horizontal plane, or otherwise, an initial velocity equal to that on the first, say 22⅔ feet. To do this on the level line would require, with a force equal to 2½ times the friction, a space of 1,280 feet, and occupy 113 seconds, so that the proportions of the real times would be 283 to 214, or nearly 4 to 3. But who would ever dream of making the velocity on a horizontal railway thus oscillate from nothing upwards, and back again to nothing?

(4.) Time from A to E = 52⅔″; from A to C=76½″; velocity at A, C, and E =22⅔ feet; that at D=30 feet, and the average velocity throughout the undulating line 25 feet per second. Hence, the speed on the horizontal road must also be 25 feet per second, to perform the distance in the same time; and we have to consider whether it is better, in practice, to use a locomotive force equal to friction, and moving with an uniform speed of 25 feet for the whole distance travelled, or one 3½ times as great for 2-sevenths of that distance at 22⅔ feet per second, the time occupied being the same in both cases.

We might conceive the locomotive power to act on the inclined planes in ways different from the preceding examples, but, I trust, these will be found sufficient for the present purpose. As, however, there is a specious appearance of advantage about some of them which may deceive persons unaccustomed to similar investigations, I will endeavour to show, generally, that in no possible case does Mr. Badnall's plan offer any real inducement for its adoption. In the first place, then, the mechanical power employed in travelling between two horizontal points, namely, the friction multiplied into the distance, must be the same ($2fc$), whatever be the road taken, provided all its parts be in the *same vertical plane*. On the horizontal *road, therefore, the* locomotive engine must be capable of exerting a constant force f, say with a uniform velocity v. Let us inquire what *must* take place on the inclined plane, so that the distance may be performed in the same time, the locomotive force F acting as follows:—(*a*) Force acting the whole distance; F=f; velocity varying from o to $2v$, ⅔ths of the strokes being made with velocities greater than v. (*b*) F acting during the descent alone, or on the ascent alone; here F=$2f$, velocity varying as in (*a*). (*c*) F acting both on the descent and ascent, but only at velocities not greater than v. In this case F must be greater than $4f$; if F act under similar circumstances on the descent or ascent alone, F must be greater than $8f$. These cases are on the supposition that the carriage is at rest at the beginning and end of each undulation; but let us now assume the velocity at these two points to be a given one, V, and we shall have, under the above circumstances, (A) F=f, and the velocity varies between V and ($2v$—V) which latter must, of course, be greater than v. (B) F=$2f$; velocity as in (A). (C) In this case the velocity can never be less than V, nor the force F less than $3f$, unless the velocity exceed v.

Now, from these conclusions I venture to assert, in opposition to Mr. Badnall's opinion, that a locomotive engine, just capable of conveying a load with a given uniform speed on a horizontal rail-road, would *not*, with the same load, be able to reach the top of the ascending plane on the undulating line. Let us suppose the boiler just capable of producing the necessary supply of steam; the engine, if properly constructed, would be little less powerful than when moving with a lower velocity, and at all events more powerful, compared with the absolute pressure of the steam (the resistance of the atmosphere opposing evacuation being considered), than when moving at double the speed. This engine, placed on the undulating line, will, as in case (*a*), have to work over the whole distance, with velocities varying from o to $2v$, or twice the horizontal velocity. Hence, at the commencement of the motion, the steam accumulating would partly blow through the safety valve and be entirely wasted, while nearly ⅔ths of the strokes being made with velocities greater than v, and consequently dimi-

nished pressure of steam, which, during evacuation, is opposed by the uniform elasticity of the atmosphere—the engine, on both these accounts, must have exerted a less effective force in the same time, and will consequently be unable to reach the top of the undulation. If there be any initial velocity, the carriage will indeed reach this point, but with a speed less than at starting. Further, it is evident that *this* engine *cannot* be employed for a portion only of the time, so as to produce the same effect, and the only means would be to make it take a longer route, so as to occupy more time, and consequently more power (being in proportion to the number of strokes, and therefore distance passed over), as in Mr. Badnall's model experiments.

I shall now proceed to analyse Mr. Badnall's experiments on the Sutton inclined plane, as given in your Journal of Oct. 12, 1833:—First taking Exp. 2, 16 (double) strokes in 10 seconds gives a velocity of 23½ feet, which is sufficient to overcome the friction of 454 yards on the level road; from this we find the friction $f = \frac{1}{115}$, and using this on the descent we get the locomotive force $= \frac{1}{110}$. Now let us take Exp. No. 1, with the above value for friction:—we have, first, a velocity of 22 feet per second, acquired in moving over 280 yards, which gives a locomotive force of $\frac{1}{65}$, and that velocity destroyed in moving up the plane 21 yards, giving friction $= \frac{1}{3\cdot 1}$! Exps. 3 and 4 are mere repetitions of 1 and 2, the accuracy of which they fully confirm; hence we must look for some other cause than errors in the Experiments to account for the remarkable discrepancy between the results drawn from Exps. 1 and 2. It may be accounted for by supposing the level road somewhat inclining towards the foot of the plane; but this would diminish our estimate for friction, drawn from Exp. 2. also that for the locomotive force during the descent; it would likewise lessen the locomotive force in Exp. 1, but by no means explain the small amount of friction in ascending the plane. The probability is (though Mr. Badnall says nothing about it), that a wind was blowing up the plane, as appears to have been the case on the following day. The only accurate conclusion, therefore, *which can be obtained from these Experiments* (and which alone Mr. Badnall appears to have had in view) is, that a greater velocity may be obtained in working down an inclined plane than is requisite by momentum alone, to carry the cargo the same distance up the plane. Proceeding to Experiments No. 5 to 11, we get from 5 the friction on the level $= \frac{1}{335}$, and from 6 and 7 the greatest speed of the engine, with which it can overcome this friction, is sufficient (on the average) to impel the carriage 130½ yards up the plane. If we calculate in the usual way the velocity necessary for this, we obtain 18½ ft., or 12½ strokes in 10″. From Exp. 11, however, we shall get only $12 \times \frac{\sqrt{130\frac{1}{2}}}{177}$ $= 10{\cdot}3$ strokes in the same time. Now this is greater than that obtained (5) in working down 147 yards, and, in fact, 10 strokes in 10″ gives 123 yards run up the plane; so that working down the plane only would, with this load, in opposition to the results of Exp. 1 and 2, cause the carriage to stop 24 yards from the summit of a similar plane. Exp. 8 cannot be reconciled with 5, 6, and 7, except by supposing the engine to have exerted a much greater power than in No. 5. Exps. 9 and 10 show that working both up and down, the carriage might reach the top of the ascending plane with a considerable velocity; but it would appear from No. 10, that precisely the same velocity was attained in working down 160 yds. as down 147 yds. in No. 5, 10 miles per hour being exactly 10 strokes in 10″. It may farther be remarked, that the velocity stated in Exp. 11 would, if there were *no friction*, enable a body to ascend only 155 yards, and, of course, if friction be also opposed, the ascent would be less. This might be attributed to the wind, but its effect cannot have been much, because friction combined with it, as in Exp. 5, amounts only to $\frac{1}{335}$. In Exp. 5, also, the locomotive power would appear to be almost nothing (about $\frac{1}{6000}$), as a body in descending, by gravity alone, 147 yds,, ought to acquire a velocity of very nearly 14¾ feet per second. There are other discrepancies which I shall not notice, further than by saying that they cannot be accounted for, except by supposing errors in the observations, or in the inclinations of the plane. Mr. Badnall

does not state in what manner he took the distances and velocities; but I suspect, that as the speed was generally a variable one, and as the train of carriages would be somewhat lengthy, they cannot have been taken with great exactness. It is also probable that the inclination given (1 in 96) is not the true one, at least at the foot of the plane. Exp. 11 would give an inclination of 1 in 163, which would explain many of the apparent anomalies. Be this as it may, the results of Exps. 6 and 7 are not affected, which show that the engine was capable of overcoming the friction with a speed of more than 10 miles per hour; while the utmost velocity obtained in working *both up and down* the plane did not exceed this, and consequently the *average* velocity was *not more than 5 miles per hour!* What grounds, then, are there for Mr. B.'s assertions (which he says are confirmed by these experiments) that a *double* load might be conveyed between the two summits of an undulation, and that there is greater economy of time, mechanical power, &c.? These experiments prove nothing that would not have been conceded to him at the outset of the discussion, and only show (however good in the abstract) that such may be made, of no value in themselves; and even though accurate, may be quoted in confirmation of theories which they disprove.

I am, Sir,

Your obedient servant,

J. H. WHITEHEAD.

Leeds, Nov. 4, 1833.

MR. NUTT'S BEE SYSTEM—REPLY OF THE REV. THOMAS CLARK TO J. P. T.

Sir,—After assailing Mr. Nutt at great length, and in no very measured terms, but, as it seems to me, with your approbation, your *veracious* correspondent J. P. T. has proceeded to attack me also. As my silence on the subject may be construed by your readers into a tacit admission that his imputations are deserved, I cannot, in justice to myself, and, I may add, to Mr. Nutt too, do less, nor otherwise, than defend myself. I do it reluctantly, because I am unwilling to load your columns with such trashy quotations as I must necessarily *make from J. P. T.'s* communications.

The charge against me in No. 589 of the Mech. Mag., p. 132, which has just been put into my hands, is—being "amenable to the public opinion, and accountable for a glaring imposition practised upon the public. Every one," continues J. P. T., "however slightly given to literary pursuits, must have heard of that entertaining and instructive work, *Spectacle de la Nature.* It is this work that has been so unmercifully dealt with by Mr. Nutt, or his reverend coadjutor, and from which work have been derived such 'rich stores of knowledge.'"

Now, in answer to this charge, and to confute J. P. T. on this point, as completely as Mr. G. W. Wood lately did on some other points, I have only to state the plain truth, and that is—that *I have never read, met with, seen, nor heard of, the Spectacle de la Nature; nor did I know, until I had J. P. T.'s information, that there is, or that there ever was, such a book:* of course I cannot have dealt unmercifully with it—nor can I have derived any stores of any sort of knowledge from it—nor can I have practised that "glaring imposition on the public," of which J. P. T. accuses me—nor have I connived at its being practised by Mr. Nutt—nor do I believe that he, any more than myself, ever heard of the *Spectacle de la Nature.* The dialogue, which has stirred up so much of J. P. T.'s bile, was given in the first edition of Mr. Nutt's book, not as a verbal repetition, but (and it is so stated) as *the substance* of a dialogue between Mr. Nutt and a learned Lord. At the time Mr. Nutt put his papers into my hands I was informed, I then believed, and *I still believe*, that it took place at the National Repository, where the lamented Mr. Tull (*a staunch friend* of Mr. Nutt's,) was, at that time, Secretary; that he, Mr. Tull, took minutes of the conversation, and afterwards, from those minutes, drew up the dialogue, and gave it to Mr. Nutt; if, therefore, Mr. Tull clothed any thing that was said on that occasion, either by the nobleman or by Mr. Nutt, in the words of "a work published nearly a century ago," be it so: I certainly had nothing to do with the matter. With a few trifling corrections, as it was given to me, it was introduced into the book, and

certainly without the slightest suspicion of its genuineness.

As J. P. T. has made so grave a matter of this alleged plagiarism, the whole extent of which does not amount to half a page in your Magazine, I would request the reader to turn to No. 564, where, in p. 156, he will find the following flippant remarks by J. P. T.:—"The remainder of his lordship's questions are so puerile, and the replies of the great apiarian so egotistical, that they are absolutely not worth making a remark upon." Now is it not curious that this remainder, actually including all "the rich stores," said to be derived from "the very popular work," should have been "so unmercifully dealt with" by J. P. T. himself—should have been dogmatically pronounced *puerile, egotistical, and absolutely not worth making a remark upon? !* I beg to recommend to J. P. T.'s perusal the preface to the second edition of Mr. Nutt's book on bee-management; and also pp. 186, 187, 188, of a work on the same subject, by S. Bagster, jun., just published.

As you expressed a wish for "matters of fact," I will, at the risk of being a little egotistical, and thereby incurring J. P. T.'s high displeasure, beg leave to state, that from one set of collateral boxes I last year took nine glasses, viz. two middle-sized and seven small ones, and one end box, i. e. upwards of 50 lbs. of pure honey; and that from the same stock I have this year taken one large and four small glasses, and two end boxes, i. e. 66 lbs. of honey. *This stock has never swarmed*, and it is at this time in as fine condition as stock well can be. From another stock, transferred in March last from a cottage hive into collateral boxes, I have taken a still greater quantity, if what was taken when the bees were transferred may be added to the account; and *this stock has not swarmed*, and it is in as fine condition as the one just mentioned. In not one of the boxes or glasses taken this year, was there one cell containing, or that had contained, either brood, or bee-bread, or any thing but pure honey. Part of those honeys is now in London, and may be seen either at the National Repository, or at 131, High Holborn. These *are matters of fact*, which my own little *apiary has during this and the* last year afforded me; and if they do not in some degree prove the superiority of Mr. Nutt's mode of bee-management, and satisfy the *unbiassed reader* that there is merit in his system, it would be but a waste of time to add others of a similar nature which have come under my immediate observation. But, to prevent a repetition of J. P. T.'s cavilling about the quantity of honey a box will contain, I would observe that the end boxes, above spoken of, are 9 inch cubes within, and that I know each of them will contain 30 lbs. of honey, wax inclusive of course; and that if the bees could fill them, they might be taken, emptied, and returned ten times, or twenty times in a season, if necessary. A 9-inch cube is 729 cubic inches, and a box 12 inches square and 10 inches deep contains 1,440 cubic inches; i. e. nearly twice as much as one of my boxes. Mr. Nutt's first boxes were larger than those recommended in his book (if I mistake not, they were $12 \times 12 \times 11$, i. e. 1,584 cubic inches); where then is the impossibility of his having had boxes of honey weighing 60 or even 65 lbs.? It is within the bounds of possibility; nay more, it is within the bounds of probability, and in my mind demolishes J. P. T.'s strongest argument against Mr. Nutt.

You have "willingly inserted your correspondent's remarks, because you think they were written in the spirit of truth." The "remarks," here referred to, are those contained in J. P. T.'s letter, that appeared in No. 573 of your Magazine. In what spirit they were written by J. P. T. may very safely be left to the judgment of your readers, apiarian or other. I do not assert that they are a disgrace to your pages, but, in my opinion, they are no credit to them. To me it seems that a spirit of illiberality and petulance in every thing relating to Mr. Nutt, and of prosy pedantry in what relates to other matters, is the spirit that predominates and pervades the whole production. With the latter, i. e. with the prosy pedantry so copiously mixed up in this letter, I quarrel not: "the sublime mysteries of masonry—the two pestilent fellows who were engaged in the building of Solomon's Temple, and the atrocious act they committed—Thomas Bozius—Dr. John Gerard's Herbal, my edition of which was

published in 1597—Huber's mutilations of queen-bees—and even the instrument ycleped a warming-pan," I willingly pass without one word of comment; but there are some other passages that deserve severer notice.

At the conclusion of J. P. T.'s objections to Mr. Nutt's inverted hive, the following "remarks" occur:—"It is farther worthy of observation, that Wildman gives in his book plates of all his hives—*these hives with glasses on them among the number*—and that Mr. Nutt mentions in his preface that some friend had made him a present of this very book." The latter part of this quotation renders J. P. T. "amenable to the public opinion," and accountable for a *glaring falsehood* practised upon the public. No where in his preface has Mr. Nutt once mentioned Wildman—no where has he said "that some friend had made him a present of *this very book*"—Wildman's. Every reader of the preface to Mr. Nutt's book may satisfy himself, or herself, as to the spirit in which J. P. T. wrote so bold an untruth.

Another instance of the same, if not of a still worse spirit, presents itself, when J. P. T., after telling us that "he is almost tempted to believe that Mr. Nutt did not intend that the reader should understand his description of the observatory-hive," goes on to say, "I must, however, return my thanks to Mr. Nutt for one piece of information he has given, of *great importance;* which is, that in writing the description of this 'grand,' this 'blessed' hive, he did not consume the midnight oil, but used 'a *tallow* candle of his *own* making, stuck in a *telescope*-candlestick, with a *square* foot!'" Here, and I say so *dispassionately*, are *deliberate falsehood, offensive personality,* and *degrading scurrility.* The passage in Mr. Nutt's book, on which they are founded, occurs in p. 107, and is this:—"That this rather intricate part—the construction of the passage-work—may be fully comprehended, I will endeavour to illustrate it by references to a well-known article now standing on the table on which I am writing. It is a telescopic candlestick, the pedestal of which covers a square space upon my table, each side of which superficial square is three inches." To me this *does not seem to* carry "the air of a deliberate piece of mystification," nor any thing to call forth the contemptible "remarks" J. P. T. has made upon it. I take it to be a laudable endeavour to make his meaning fully and clearly understood; and, for any thing that is said, the candlestick might be placed upon the table for the express purpose of reference, and Mr. Nutt be writing in broad day-light.

Two hives of bees will quietly unite on being put together, provided one of the queens be taken away, and kept away. Neither Mr. Nutt, nor any person, with the least pretensions to apiarian skill, ever attempts to unite two stocks of bees, without first abstracting the queen from that which is to be added.

The thermometer *is not dispensed with* in the inverted hive. Mr. Wood has told J. P. T. that the ventilating tubes are receptacles for thermometers. Into the ventilating chamber, i. e. the part between the hive and the floor for the glasses (of which chamber *Wildman in his book has given us no plate*), are introduced *two ventilators;* and four or six, if necessary, might easily be used.

I challenge J. P. T. to produce the passage in Mr. Nutt's book, in which "he calls himself the discoverer" of that process, viz. fumigation. The fumigator, however, is Mr. Nutt's own invention—is Nutt's steam-engine among bees, for which he deserves to be rewarded with something better than J. P. T.'s vituperative attacks.

When I came to the following J. P. T. flourish:—"An ancient author, named Publius Virgilius Maro, has recorded his opinion against Mr. Nutt very decidedly in the following words," I anticipated the pleasure of a line or two from Virgil; but on reading on, instead of one word from "Publius Virgilius Maro," I read this, "as rendered by Dryden:"—

> "The youthful prince, with proud alarm,
> Leads out the vent'rous colony to swarm."

And this is the opinion of "Publius Virgilius Maro," recorded against "Mr. Nutt *very decidedly*," 1821 years *before poor Nutt was born!!* Curious and valuable as this record may be, it decides nothing at all: for Virgil, unluckily for J. P. T.'s argument, throughout the fourth Georgic, makes his sove-

bees—KINGS: a queen is not so as mentioned within the first 110 His sovereign-bees are "magos duces—novi reges—duobus re—circa regem—ipsi (reges)—vioductores—alter hic melior—regum —regibus alas eripe :—

lor qui visus; eum, ne prodigus obsit, etc."

therefore, Virgil was under a miss to the sex of the sovereign-bee, hardly be contended that he was istaken as to its age also. But r, I happen to have two editions den's Virgil, in each of which the ord of the second line of the above t is—*calls*, not "leads," as J. P. T. ven it. Why this misquotation? t not rather to strengthen a weak ent, *at the expense of a little* y, than to meet the case fairly, in the spirit of truth?" A youthnce may *call out* his subjects with*ding* or going along with them: thful queen may, for any thing . can prove, even if he possessed vorks of Aristotle and the elder and could avail himself of those uthorities," call out the swarm, e old queen may lead it notwithg. But if J. P. T. be still dis d with the results of Mr. Nutt's nents, and with "the easy and tious way" in which he has d a problem, which occupied the igable Huber, and his equally inable Secretary, many years," I suggest to him, and to any other who may be desirous to *prove the* s to what queen goes with a first a still more easy and expeditious l of ascertaining it than that l by Mr. Nutt. To me it is—bsolutely astonishing," but only a rprising, that a person so acute, deeply read, and *experienced*, as y try to suppose J. P. T. to be, t long ago hit upon it, and set itated question at rest. It is this oon as a first swarm has been ived, and the bees have all set d become peaceable in their new take it, and proceed with it, ac to the directions given in p. 44 Nutt's book, second edition. By ple process it may in ten minutes ertained whether *the old* or a *queen has gone with the* swarm, provided there be any body present who actually knows an old queen from a young one. It would not at all increase *my* surprise, if, after a hundred of these experiments fairly made, it should be found that all the great apiarians, and Mr. Nutt among the rest, have been both right and wrong.

There are other matters in J. P. T.'s *August* letter that I have marked for correction—his objections to the inverted hive in particular; but having already gone to greater length than I intended, I will only add, by way of administering a little consolation to J P. T., on parting with him, that Mr. Nutt's book, although it has not been published two years, has arrived at a second edition—has been translated into the German language—has been translated into the French language—and has been republished in America.

I am, Sir, yours, &c.

THOMAS CLARK.*

Gedney-hill, Dec. 20, 1834.

IMPROVED MILL-STONE.

The following engraving represents an improvement in mill-stones, which, from the following certificates, would seem to be of very great importance. It consists principally in letting in the air, as denoted in the figure, on the flour while grinding, and in expediting the operation. The patentee, James Preston, resides at Auburn (U. S.).

"Auburn, March 18, 1833.

"We, the subscribers, having examined the plan for which James Preston has obtained a patent, for the discovery of an improvement of preparing mill-stones to expedite the grinding of grain; and also seen an experiment of the grinding of grain at the mills of Carhart and Polhemus, in the village of

* Mr. Clark's letter is inserted, as he desired, *without any alteration whatever*. He will not, therefore, have to complain that his defence has suffered from any curtailment of the civility for which it is so remarkably distinguished. We think we could easily point out several things in his letter which, *however civil*, are not very creditable to his candour and impartiality; but J. P. T. is able enough to vindicate himself, without any assistance from us—we therefore forbear.—Ed. M. M.

Auburn, with mill-stones prepared and dressed according to the improvement for which said patent is obtained; do hereby certify that we were present at said mills, and saw 15½ bushels of wheat ground with one run of stones, in a superior manner, for flour, within the space of one hour.

"AMBROSE COCK,
"J. S. MILLER,
"E. MILLER."

"Manlius, May 18, 1833.

"We, the subscribers, having had our plaster mill-stones dressed by Mr. James Preston, according to his method of dressing, feel bound to say, in this certificate, that our mill ground twice the quantity in the same given time, and equally fine.

"JACOB R. DE PREY.
"JAMES I. D'ELORY."

"Milford, June 4, 1833.

"Fifty-two bushels and a half in four hours and forty-nine minutes; the flour very good.

"DISBOROUGH AND LUDLOW."

"Auburn, April 1, 1833.

"We certify that the patent of James Preston, for an improvement in mill-stones, has been in operation in our mill, at Auburn, for several months; it more than doubles the grinding, grinds much cooler, and separates the flour altogether better in the bolts, and greatly improves the quality.

"CARHART AND POLHEMUS."

American Railway Journal.

BRITISH SCIENTIFIC ASSOCIATION—THIRD REPORT.

We believe it will be pretty generally admitted, that the "British Association for the Advancement of Science" has proved a complete failure in its grand object—that of rescuing science from its (alleged) abject condition in this country, by the novel means of getting together some hundreds of ladies and gentlemen, "only once a year," to listen to a lecture instead of a concert, and to stare at a company of professors instead of a company of performers. Still its admirers *do not give it up* entirely; they insist *that, if its grand meetings* are "full of mere sound and fury, signifying nothing," the volumes of its Transactions make up for the deficiency, by presenting, especially in the reports as to the progress and present state of the various sciences, a very valuable body of information, such as was before inaccessible, if not altogether, at any rate in any concise and digested form. There is, undoubtedly, a good deal of truth in this plea; but then it does not bear in the least on the main point of the utility or inutility of an annual migration of "the scientific world" to one particular spot,—a mea-

sure which its projectors assured us would infallibly produce the most miraculous effects.

If the Reports alluded to arose naturally out of the circumstances attending the Annual Meeting, there might be some force in the observation,- but such is not the fact. The very title of the book before us* is a gross misnomer. The report of the third meeting of the Association forms but a very small, and, assuredly, far from the most valuable, portion of its contents; while the main body of the book, that very part which is held up as doing the highest honour to the learned body, is the product, not of the combined knowledge and experience of the Association, struck forth at once on their coming into collision in the classic halls of Cambridge,—but of the unaided toil of two or three solitary philosophers, in the quiet of their own firesides! So little, indeed, had the meeting to do with these redeeming features of the plan, that it appears slight abstracts only of their contents were read before it. The ladies—and *some* of the country gentlemen too perhaps—preferred the liquid notes of Malibran, or the brilliant fireworks of the Chevalier Southby, to the more solid gratification to be derived from listening, for two or three hours, to so interesting a paper as Mr. Peacock's "Report on the Present State of Analytical Science," or Professor Barlow's, "On the Strength of Materials." To give every one his due, the Council acted wisely in reserving these Reports in their totality for the press—since what could have been more ridiculous than the reading, to a mixed assembly, several long essays on subjects necessarily involving a long train of abstruse calculations, to follow which, time and the seclusion of the study are requisite, even to the practised mathematician?

But this is not all. We have seen that the main body of this *soi-disant* "Report" is composed of matter having a very slight connexion with the meeting to which it professes to refer; and a short extract from the Preface will serve to show how cavalierly the actual proceedings are treated in this their chronicle for posterity:—

"However valuable a part of the proceedings of the meetings the verbal communications may be, it is evidently impossible to publish a safe and satisfactory report of them from any *minutes* which can be taken." Thus one-half of these valuable results of association are disposed of,—and what becomes of the other?

"The second rule is, not to print any of the miscellaneous communications *at length*; but either *abstracts* of them or *notices* only,—the object of the rule being to keep the Transactions within the bounds which the Association has prescribed to itself, and to prevent any interference with the plans of other societies."

This is going very far towards proclaiming the utter uselessness of the meetings, for any purpose whatever: since it is assumed that the written papers read at them are to be met with elsewhere, and that their *viva-voce* proceedings cannot be recollected with sufficient precision to answer any useful purpose. If it be evidently impossible to give a safe and satisfactory report of them from "any *minutes* which can be taken," how confused and incomplete a notion must be carried away in the heads of the motley troop of hearers, unassisted by any minutes at all! And this was expected to be the most admirable feature of the whole plan! If its most peculiar claim to distinction is given up thus coolly, what may be expected to become of the whole concern in the long run? *Perhaps*, after all, it may not outlast that old-fashioned, un-peripatetic institution—the Royal Society! It will be well if it ever contribute half so much to the Treasury of Science.

The only part of the proceedings at Cambridge, given at length in the volume, is a speech by Professor Whewell, on the objects of the Association, chiefly remarkable for its rhapsodical style, and for the contempt with which it treats the pretensions of "Practical Science," to a prominent place in the transactions of a body of British philosophers. Notwithstanding this contempt, however, we are glad to perceive that much more attention has been paid to this subject than was before the case. In the former volume of the Reports of the Association, a very few pages only bore the least relation to it, and not one of the reports on the progress of the various branches of

* Report of the Third Meeting of the British Association for the Advancement of Science: held at Cambridge, 1833. London, *Murray*, 1834. 8vo. *pp.* 504.

science was devoted to this most important and really useful of all;—on the contrary, we are *now* presented, out of eight Reports altogether, with no less than three relating to it:—one on "Mineral Veins," by Mr. John Taylor; another on "the Present State of our Knowledge as to the Strength of Materials," by Professor Barlow; and a third on "the Progress and Present State of our Knowledge of Hydraulics as a branch of Engineering," by Mr. George Rennie. This we are glad to see; there could not have been a better *practical* reproof given to Mr. Whewell's anti-practical tirade.

The remainder of the Reports are on "the Philosophy of Botany," by Professor Lindley; "the Physiology of the Nervous System," by Dr. Henry; "the Magnetism of the Earth," by Mr. S. H. Christie; "the Analytical Theory of Hydrostatics and Hydrodynamics," by the Rev. J. Challis; and (a very long and elaborate one) on "Certain Branches of Analysis," by Mr. G. Peacock. It is to be regretted that some, even the longest, of these, are incomplete,—fragments only of the whole Report "to be combined" in future volumes of the Transactions of the Association: for it is to be feared that, however determined their authors may be, to put the finishing stroke to their respective labours, a thousand circumstances may occur to procrastinate, if not entirely to prevent, their completion. It is always desirable, at any rate, to have the whole of such a subject as most of the Reports refer to under the eye at once.

As it would be hardly possible to select an extract, from this part of the volume, short enough for our pages, and yet long enough to do justice to its author, we have preferred taking a quotation from the more manageable "Transactions of the Sections:"—

"Mr. Taylor exhibited a section, showing the depths of shafts in the deepest mines in the world, and their position in relation to the level of the sea.

"The absolute depths of the principal ones were:—

	FEET.
1. The shaft, called Rochrobichel, at the Kitspuhl mine, in the Tyrol	2,754
2. At the Sampson mine, at Andresberg, in the Harz	2,230
3. At the Valenciana mine, at Guanaxuato, Mexico	1,770
4. Pearce's shaft, at the Consolidated mines, Cornwall	1,464*
5. At Wheel-Abraham mine, Cornwall	1,452
6. At Dolcoath mine, Cornwall	1,410
7. At Ecton mine, Staffordshire	1,380
8. Woolf's shaft, at the Consolidated mines	1,350

"These mines are, however, very differently situated with regard to their distance from the centre of the earth, as the last on the list, Woolf's shaft, at the Consolidated mines, has 1,230 feet of its depth below the surface of the sea, while the bottom of the shaft of Valenciana, in Mexico, is near 6,000 feet in absolute height above the tops of the shafts in Cornwall. The bottom of the shaft, at the Sampson mine, in the Harz, is but a few fathoms under the level of the ocean; and this, and the deep mine of Kitspühl, form, therefore, intermediate links between those of Mexico and Cornwall.

"Mr. Taylor stated, that taking the diameter of the earth at 8,000 miles, and the greatest depth under the surface of the sea being 1,230 feet, or about $\frac{1}{4}$, of a mile, it follows that we have only penetrated to the extent of $\frac{1}{1760}$ part of the earth's diameter."—p. 427.

Mr. Taylor is always quite at home on the subject of mining, to which he appears to pay exclusive attention. The following statement, the facts of which are drawn chiefly from his own experience, is full of curious particulars:—

"The Consolidated mines form the most extensive concern in Cornwall, embracing what were formerly several distinct mines, which, as the name indicates, were connected in one undertaking.

"This was arranged in 1818, and the mines, which had remained unwrought for many years, were drained by very powerful steam-engines, and were put into a state of active working. The management was confided to Mr. Taylor and the late Captain William Davey; an outlay of 73,000*l.* was incurred, which has since been repaid with ample profit. The present produce is 20,000 tons of ore in a year, yielding about 1,920 tons of fine copper, being one-seventh of the whole quantity raised in Great Britain. The mines employ about 2,400 persons, of whom about 1,400 are miners working under ground. The water raised to the adit level is about 2,000 gallons per minute: the height to which this is lifted is more than 220 fathoms, or 1,320 feet; the aggregate weight of the columns of water in the pumps being 512,000 pounds, or about 230 tons, and the whole is put in motion by eight immense steam-engines, four of which are the largest ever made.

"The depth of the mines has been increased 100 fathoms since the period of the

* *Vide the last* number of the Mech. Mag.

drainage being completed, being at the rate of about eight fathoms a year.

"There are, in the whole concern, 95 shafts, besides other perpendicular communications from level to level under ground, called winzes. The depths of the whole added together make up about 22,000 fathoms, or 25 miles; and the levels or galleries will make up, in horizontal distance, a length of 38,000 fathoms, or about 43 miles.

* * * * *

"Mr. Taylor gave some account of the extent to which steam-power is at present employed in Cornwall, in draining the mines which penetrate so far beneath the level of the sea, showing the influence that the great improvements which have, from time to time, been made, and many of them even recently, must have upon the production of some of the most useful metals.

"The number of steam-engines used in pumping water from the mines in Cornwall, in Dec. 1832, was altogether 64.

"Some of these are of immense size and power; there are five in the county, of which the diameter of the cylinder is 90 inches, the pistons making a stroke of 10 feet. Four of these are at the Consolidated Mines; and the first constructed of this size was planned and erected there by Mr. Woolf. The beam of such an engine weighs 27 tons; the pump-rods are of mast timber, 16 inches square, connected by iron strapping-plates of enormous weight. The column of water lifted, the rods and beam, make up a weight of 100 tons; and this is kept in motion at the the rate of from 5 to 10 strokes per minute.

"The quantity of coal consumed in drawing water, in the same month, in all the mines of Cornwall, was 84,034 bushels, and the quantity of water delivered, about 19,279 gallons per minute. The weight of water actually poised by all these engines, to produce this effect, amounts to about 1,137 tons.

"From calculations carefully made in Mexico, as to horse power employed in draining mines, and deduced from a large scale of operations, it is found that the performance is equal to 19,000 lbs. raised one foot high per minute for each horse.

"According to this rate, the coal consumed in Cornwall in a month being 84,000 bushels, or 2,800 per day; and taking the duty of the engines at 55,000,000 lbs. lifted one foot by each bushel, which is very nearly the fact, it will be found that the sixteenth part of a bushel does as much in raising water in Cornwall as a horse does in Mexico (working 3 hours out of 24), and that thus the number of horses required to drain the mines of Cornwall would be 44,800."—p. 428.

LIST OF NEW PATENTS, GRANTED BETWEEN THE 26TH OF NOVEMBER AND THE 25TH OF DECEMBER, 1834.

Franz Anton Bernhardt, of Upper Montague-street, Montague-square, architect, for certain improvements in warming and airing buildings. [The time for inrolling this patent is doubtful at present.] Dec. 4.

William Alfred Noble, of Cross-street, Cherry Garden-street, Bermondsey, engineer, for certain improvements in applying the steam to common and other engines. Dec. 4; six months to specify.

James Hudson, of Gale, near Rochdale, Lancaster, calico-printer, for certain machinery and apparatus applicable in block printing on silk, woollen, cotton, and other fabrics, and on paper. Dec. 4; six months to specify.

William Ranger, of Great Dean's-yard, Westminster, builder, for certain improved modes of preparing and combining various materials, whereby the moulding or forming blocks, casts, walls, or other aggregates in those said materials, may be considerably expedited, being improvements upon a patent granted to him for Ranger's artificial stone. Dec. 4; six months to specify.

John West, of Crayford, blacksmith, for an improvement on forges. Dec. 9; six months to specify.

Edward Massey, sen., of King street, Clerkenwell, watch-maker, for certain improvements in the apparatus used for measuring the progress of vessels through the water, and for taking soundings at sea. Dec. 9; six months to specify.

Richard Bettfort, of the Tavistock-hotel, Covent Garden, for a certain newly-invented machine or apparatus, called a physiognotype, by means of which a perfect fac-simile of the human countenance can be immediately produced, or the exact copy of a bust or sculptured figure, or of a living or other subject, taken, being a communication from a foreigner residing abroad. Dec. 18; six months to specify.

Joseph Hansom, of Hinckley, Leicester, architect, for an improved vehicle for the conveyance of various kinds of loads on common and other roads. Dec. 23; six months to specify.

Joseph Ferguson, of Carlisle, manufacturer, for a certain combination of processes whereby a new kind of dress or finish is given to certain goods. Dec. 23; six months to specify.

Elijah Galloway, of Westmoreland-place, City-road, engineer, for certain improvements in steam-engines, which improvements are applicable to other purposes. Dec. 23; six months to specify.

Henry Stothert, of Bath, founder, for certain improvements in ships' hearths or cabouses.* Dec. 23.

John Smith, of Bradford, York, machine-maker, for a certain improvement on chisels or instruments for cutting or dressing stone and certain other substances. Dec. 23; two months to specify.

Robert Beart, of Godmanchester, Huntingdon, miller, for improvements in machinery or apparatus for making bricks. Dec. 23; six months to specify.

William Crofts, of New Radford, Nottingham, machine maker, for certain improvements in certain machinery for making figured or ornamented bobbin net, or what is commonly called ornamented bobbin-net lace. Dec. 23; six months to specify.

* The time for inrolling not mentioned in our official list.

Richard Sinister, of Manchester, ironmonger, for an improvement in the manufacture of such pens as are usually made of steel or other elastic metal. Dec. 23; six months to specify.

Peter Fairbairn, of Leeds, mechanist, for an improved method of preparing, slivering, or roving, hemp, flax, and other fibrous substances, for spinning. Dec. 23; six months to specify.

John Browne, of Bridgewater, Somerset, merchant, for an improved instrument or apparatus for ascertaining levels. Dec. 23; six months to specify.

NOTES AND NOTICES.

One of Mr. Russel's Steam Carriages has arrived in town from Scotland, and is shortly to be employed, along with some others on the same plan, on the London and Greenwich road.

M. Le Clerc, the proprietor of an iron manufactory near St. Etienne, in France, is reported to have discovered a method of melting soft iron (*fer doux*), which has hitherto been considered as infusible, even at the greatest heat which could be obtained in the furnace.—*Athenæum.*

The boilers of H. M.'s steam-packet Carron, which has recently arrived at Woolwich, after an attendance of several months on our fleet in the Mediterranean, have been found much injured by the saline incrustations to which they were subject on that station. The deposit is stated to be greater in one week in the Mediterranean, than in six months in plying between Falmouth and Lisbon. It amounted usually to one eighth of an inch per diem. Nor is the waste of the boilers the only thing complained of; for, in consequence of the interception of the heat by the saline deposit, a much greater quantity of fuel than usual was required for the furnaces.

The Dublin and Kingstown Railway, designed by Mr. Vignoles, C. E., and executed under his immediate superintendence, is now completed, and at work. A correspondent at Kingstown speaks of it in the following terms:—"Our noble railway is at length in full operation, and the theme of universal admiration. The steam-carriages are carrying thousands daily, and more are sent away than can be accommodated. The working of these carriages is admirable, and reflects great credit on their manufacturers. A contrivance has been adopted here (called, I believe, a buffing apparatus), for preventing those sudden shocks experienced on other railways, at the starting and stopping of the carriages, of which you would do well to obtain a particular account." We have been promised a description of the buffing apparatus alluded to by our correspondent, and hope soon to lay it before our readers.

Wine from the Common Bramble.—Five measures of the ripe fruit, with one of honey and six of water, boiled, strained, and left to ferment, then boiled again, and put in casks to ferment, are said to produce an excellent wine.—*Recueil Industriel.*

Preservation from Rust.—M. Payen has preserved, during many months, polished instruments of iron and steel, by keeping them in solutions of potash and soda. A very small quantity of the alkali is sufficient—thus $\frac{1}{2000}$, and even $\frac{1}{3000}$, of caustic potash in water, will preserve from oxidation bars of iron, &c., immersed in it. Lime water, diluted with its own weight of water, answers the same purpose.—*Revue Enc.*

Imitation of Gold. — A chemist, of W ton, United States, has published the fo recipe for a preparation which, applied will make it look like gold:—"Take of oil three ounces; tartar two ounces; yolk boiled hard and beaten, two ounces; aloes ounce; saffron five grains; turmerick two Boil all these ingredients in an earthen vess with it wash the iron, and it will look li If there be not linseed oil enough, you ma more."

Days of the Creation.—Supposing that th inhabitants at the poles of the earth, ho they understand the days of the creatio them a day of light is six months long, and of darkness six months long, and a day ma night and day covers a year, and it is a d limited by morning and evening. Su sons, therefore, must suppose, upon the understanding of the days of the creation, least six years were employed upon the wo also at the polar circle there is every year o that is, one continued vision of the sun for four hours, and one continued night of twe hours; while every where within the polar ci day and the nights, respectively, are for six more than twenty-four hours, extending we advance towards the poles, through the many of our days and nights. How are t bitants of these regions to understand the the creation, if limited to the literal interp of the inspired record?—*Professor Silliman*

THE THING AT LAST.—"*To all Nation guages and People, Greeting*—KNOW YE Nimrod Murphree, of the city of Nashvi State of Tenessee, have discovered perpe tion. N. Murphree."—*Nashville Banner.*

Accident to Burden's Twin Steam-boat observe, from the American papers, that t has been so much damaged, by accidenta ning foul of a dam in the Hudson, as to be, present, completely disabled. The *Alban ing Journal* says—"Both cylinders are destroyed. The loss will not fall below 25 lars. The channel was obstructed by ves tween one of which and the dam the boa pass. Finding the passage too narrow, t first rang his bell to 'stop her,' and the back.' This last bell the engineer mistook one to 'go a hea l,' which brought her up dam."

H. D. No; but if he will favour us with dress, we shall be happy to give him the very full account (in French) of the proces

H. W. would oblige us by a descriptio apparatus mentioned in his postscript.

Mr. Harvey in reply to Mr. Lamb; an Redivivus in reply to Birch Rod, in our n

Communications received from Mr. W Enort—Mr. Bowser—Cadogan—A Constan (Chelmsford)—G. S.

The Supplement to Vol. XXI., with a on Steel, of the late Mr. Telford, is no Price 6*d.*; also the Volume complete, in Price 8*s.*

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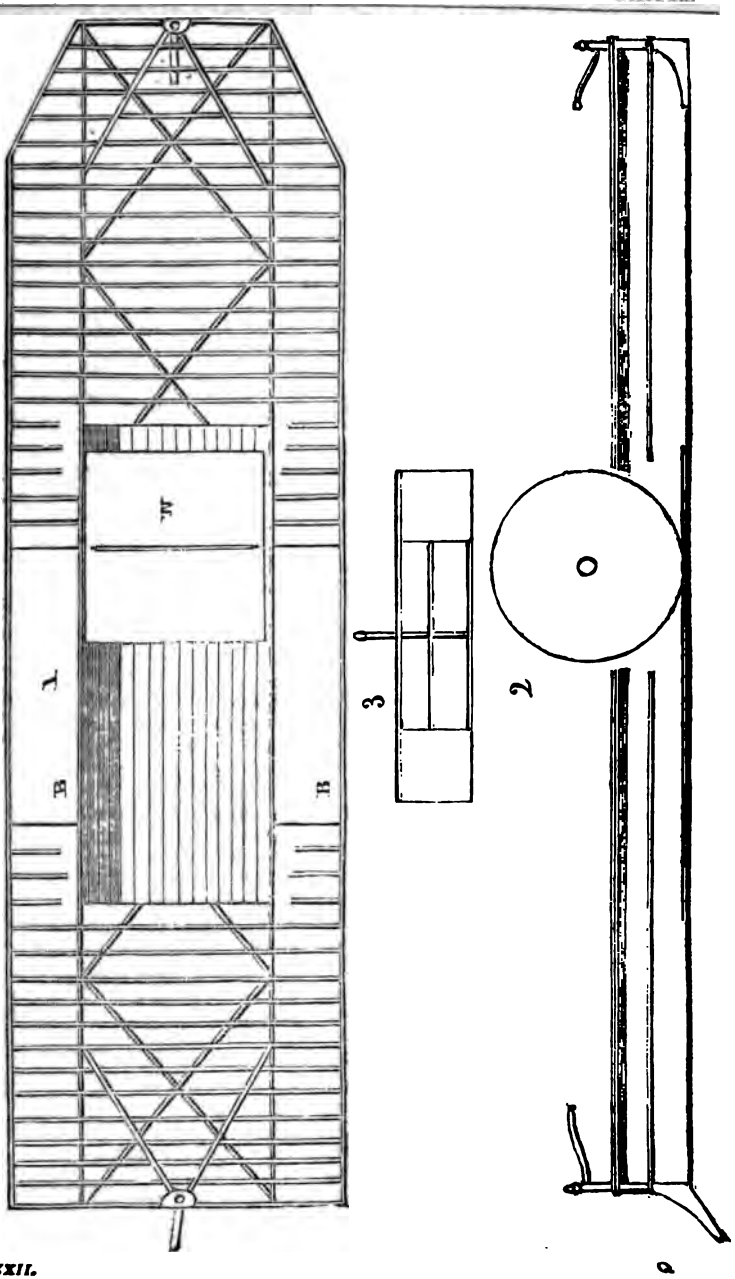
ALDERSEY'S IMPROVED TWIN STEAM-BOAT.



IMPROVED TWIN STEAM-BOAT.

Sir,—From a communication received from one of your intelligent correspondents, with reference to my paper on the utility and benefit of the conduit proposed as an appendage to the steam-boat, the plan of which appeared in your No. 586, I am induced to believe I did not make myself fully understood. I must beg, therefore, a page in your useful Magazine for the purpose of explanation; and as I continue still of opinion that the twin form of vessel is better calculated than any other for rapid conveyance, I will take the opportunity, at the same time, of inviting attention to certain modifications of the design published in No. 577, which appear to me, on further reflection, to be expedient.

I propose, then, that the twin-boat shall be in length 100 feet; each of the boats six feet in breadth, and six feet in depth; the water-course between them 16 feet; and that the engines and boilers shall be placed on the floor of each boat. The bows are to be formed as in the prefixed figure, and to measure 12 feet from the point of the stem to the termination of the angle from which it springs on the external side. The sides to be upright, and strait from the point of the stem to the stern. The bottom and other parts as formerly proposed in No. 577.

I am anxious to impress on the attention and judgment of the parties interested in the improvements now making such rapid progress, the possible benefit a conduit would be of, which may be applied with great facility, and at a very small expense to this form of vessel. In a twin-boat of the above dimensions, with a water-way of 16 feet in width, and a conduit attached thereto, I should not think it necessary to place the wheel at the stern, to obtain the necessary resistance to the paddles. I should therefore place the wheel forward, and the engines on the floor of the boats, as in the figure.

In the case of railways, it is obvious that the resistance of the rail of the locomotive steam-carriage to the action of the wheel, is the sole cause of effecting the rapid motion of the carriage with its train. *And the resistance* which the turnpike-*road opposes to the* wheel of the steam-carriage is, in like manner, the cause of its moving forward at a rate proportionate to the power of the engine.

If, then, we can by any means procure the necessary resistance to the wheel of a twin-boat, we may reasonably expect the same results; and this, I think, may be done by means of a conduit. Suppose the wheel were placed in the water-course, 56 feet from the stern—that the paddle or float were 16 inches deep—that the front part of the conduit were carried 10 feet from the centre of the wheel towards the bow, for the purpose of receiving the water, and to extend from the centre of the wheel, say 30 feet towards the stern. The conduit would then consist of a level floor, and two sides formed by the parallel sides of the vessel, and the floor being brought up close to the float of the wheel, would leave room enough to clear without danger of coming in contact with the float or paddle, from the undulations of the water. Such a column of water, 16 feet in breadth, 30 feet in length, and 16 inches in depth, gives 640 cubic feet of water, the weight at, say 63 lbs. a foot, gives 40,320 lbs. Now, it will be readily admitted, that the wheel could not throw back a single foot of this column, *without acting equally on the whole*, because the water could find no way of escape but at the stern end of the conduit; consequently the resistance arising from the inertia, or passive power, of such an immense weight of water, would be every moment opposed to the active power of the wheel, and must effectually resist the progress of the float or paddle coming in contact with it.

There appears to be no possible comparison between the resistance opposed to the float of the wheel, and the resistance which the water in the front would oppose to the sharp-pointed bows of the vessel. I should think the latter would not amount to a tenth part of the former. The necessary consequence of this would be, that no part of the engine-power would be lost or wasted, by the wheel throwing the water back; for the whole would be expended in promoting the velocity of the vessel.

The floor may be secured by flat iron bars, let into the under side of it, and firmly fixed to the sides of the vessel, and the expense of this addition would

that would be necessary to ascer-
: result.
ust be remembered, that the co-
f water in the conduit can be no
whatever on the vessel, because,
it is brought to oppose the wheel
assive power, yet it remains in all
s a part of the river itself, there
ecessarily as great a pressure on
ler as on the *upper* side of the
the conduit.
ist beg your readers to consider
sent communication in connexion
y former paper on the twin-boat,
appeared in No. 577, where re-
is made to many points, which I
ot here repeat (regard being al-
ad to the errata in 578). Cross-
ces may, of course, be added, or
ng else which to the builder may
necessary to give complete effect
principle.
uld here suggest, that if ever the
hould be made available for nau-
rposes, the water-way of a twin-
ould furnish a most suitable situa-
it.
our last Number there is a notice
lisaster having occurred to the
American steam-raft. I cannot
serving, with respect to the very
r form of that steam-raft, that it
ear to me particularly dangerous.
linders are eight feet diameter,
e vessel draws about 30 inches
hen loaded, so that there is a
of five feet six inches to the deck.
o engines, boilers, chimneys pos-
considerable leverage, coals, &c.
all placed upon the deck; and
er-wheel is of the immense height
et diameter, with 16 feet length of

The shaft of this wheel must,
e, be about seven feet above the
k. How, then, shall we find the
of gravity? It appears at least
ten feet above the load water-
nd if we take the centre of the
ay as the centre of motion, what
revent the vessel capsizing, the
t the centre of gravity passes the
the centre of motion?

I remain, Sir,

Yours respectfully.

W. ALDERSEY.

, near Hackney,
c. 20, 1834.

AXLETREES AND AXLE-FRICTION—REPLY OF JUNIUS REDIVIVUS TO "A BIRCH ROD."

Sir,—In the olden time, ere yet the "schoolmaster" had gone "abroad," "A Birch Rod" was a most unanswerable argument, for the schoolmaster had it all his own way, and no one was simple enough to expect candour from him. Our modern "Birch Rod" seems not to have departed from the ancient practice, for his communication in No. 593 is singularly deficient in candour as well as definite language. The latter may arise from a want of clear ideas; the former is a sin against science and truth.

"Birch Rod" considers it a strong presumption that Birch's axles are perfect, because—

"The Society of Industry and Manufactures, &c. (that "&c." will cover many things) of Paris have just elected Mr. Birch a member, in consequence of his patent axle;" and, moreover, "because Mr. Birch has already fitted up seventeen carriages with his improved axletree."

When Sterne alleged that he doubted whether the buckle (curls) of the wig the French artist was about to sell him would stand, the Frenchman replied in an ecstacy of indignation, "You may plunge it in the ocean, and it will stand." The ocean happened to be some hundred miles off, but the artist did not offer the trial of a pail of water in the next room. Even so Mr. Birch's friend goes all the way to Paris for a testimony to his axle, which is manufactured in London. Are the French mechanicians, then, so far behind the English, so confessedly their superiors, that the opinion of the aforesaid Society is sufficient to stamp the merit of an invention? And taking it all for granted, even to the extent "Birch Rod" would wish, is it quite certain that public bodies never make a mistake; that no man gets initial letters tacked to the end of his name, without being in reality a man of high skill and science? Is it quite proven that the Duke of Sussex is a man of more science than Mr. Babbage? It is mere shuffling, to refer thus to collateral questions, without bearing directly on the point. That the French mechanicians consider Mr. Birch's axle

a good one, may only be a proof that it is good as regards the usual quality of French axles. France is not the country, of all the earth, most famed for excellence in locomotive-machines. As to the fact of seventeen of Mr. Birch's axles being in actual use, it proves nothing either for or against their excellence. How long has the patent been out? An axle might possess undeniable excellence, yet opposing interests and circumstances might keep it unknown for an indefinite period. Mr. Birch has seventeen axles in use. Of axles on the mail principle, there are probably seventeen hundred in use or more, yet Mr. Birch's axle is decidedly superior in every respect, but weight, to the mail axle.

"Birch Rod's" letter is altogether so loose, that there is a difficulty in grappling with it. Who are the "mechanics who consider double nuts superfluous?" No mechanic—i. e. no one conversant with sound mechanical principles, will deny that it is of importance to have the nut as firm as possible on the axle-arm; and there is as yet no known method of accomplishing such an object, except by the double nuts. A single nut can never be made firm, and all that the linch-pin can do is to prevent it from turning round; it will shake and jar notwithstanding. Great stress seems to be laid on making the nut of iron, instead of gun-metal. There is nothing in this. Collinge's nuts might be made of iron, if it were considered more advantageous, but it is not so. The gun-metal and iron, work better together than two iron threads, and it is not found in practice that any mischievous amount of verdigris arises.

The next paragraph shows that the writer is strangely at a loss for clear comprehension; for, surely, he could never suppose, that after examining the wood-cuts in the Mech. Mag. I could find in them any approach to a *conical screw*. It would almost seem like wilful misapprehension in "Birch Rod." To prevent any future mistake, be it known, that I understand his nut to be a piece of iron, an inch and a half long, hexagonal on the outside, and cylindrical in the bore, where the female *screw is cut—the* external part of the *inside end being* enlarged to a collar, *turned to a conical form* where it meets the axle-box. Now, I maintain that no ordinary axletree-maker, working with ordinary rapidity and ordinary tools, can cut a thread so true, that the face of the cone shall fit accurately the end of the box, in all positions, as it is screwed up. Nothing but accurate machinery could accomplish this as a manufacture. Those who cut screws for the purposes of calculation and division, will perfectly understand this. "Birch Rod" evidently does not understand the true principle of coning the nut, when he talks about "preventing friction and noise." The object is to insure truth of motion when in action. What truth would there be in a lathe-mandril working flat against a collar, without a cone? Against the shoulder of a Collinge axle there is usually no cone, but it is somewhat compensated for by the breadth of the collar.

The advantages of the cylindrical barrels I have given credit for in my former letter. But "Birch Rod" is disingenuous, in calling the "inconsiderable extra weight of these barrels" the only counterbalances. If he knows any thing about the axle, he knows, or ought to know, that the extra size of the circumference of the box, as well as the weight, occasioned by the introduction of the barrels, is a far greater evil. The next sentence is most inconsequential.

"Will he (Junius) believe that the axletree taken out of the cabriolet before adverted to, weighed 14 lbs. more than the patent axletree that supplanted it?" This is so exceedingly loose that it is irksome to answer it. What was the quality, weight, and size of the first axle? If too heavy for its work, Mr. Birch's might very well be lighter. Mr. Birch's might also possibly be too light. Let us know the weight and size of each, and we may be enabled to judge. But it is quite clear, that if the arms and other parts were of the same size, one of Mr. Birch's axles must weigh heavier than one of Collinge's, on account of the barrels, and consequently larger circumference of the box.

There is no doubt that an axle-arm, with a longitudinal groove, is less liable to break than one with a transverse incision; but when surrounded by an accurately fitting box, there could be scarcely any practical difference of

th, for no axle breaks in the cen-
the arm; if it breaks at all, it is
shoulder. The longitudinal grooves,
all, are disadvantageous in one
t, inasmuch that particles of silex
g into the grooves would make
perfect cutters. Whether the grooves
the arm or in the box can matter
and grooves have been made in
for a long period. Price, of Mar-
street, who manufactures Collinge's
as well as Collinge himself, sinks
riangular grooves in his boxes, for
irpose of holding oil, and catching
sual grit.

Birch's gig, it seems, ran alto-
omewhere between six and seven
nd miles without more than once
. If it were a good-sized wheel, with
d-sized arm, plenty of oil, and
t weight, there is nothing extra-
ry in it. Collinge's axles would
much.

o are the "scientific men" who
for Sir John Conroy's knowledge
chanics, i. e. capacity for judging
chanical excellence?

the next paragraph there is still
harping on iron nuts, in opposition
n-metal. Is there any thing new
iron nut? Were not iron nuts
ong before gun-metal ones? and did
un-metal ones take their place for
s which have not yet been found
fallacies?

irch Rod" has given no answers
questions I put about the size of
s, tire, &c. of Mr. Ramsbottom's
let.

offer to try axle for axle with
ge in a stage-coach is fair enough,
ere can scarcely be any difficulty
ing the matter. Collinge does, I
e, supply many stage-coaches, and
is axles without leathern washers
shoulder, preferring a cone in-
The consequence is a noisy rat-
ut this the stage-coachmen are not
ous about. I was not aware of
ct when I wrote last.

me assure "Birch Rod" that I
no way influenced by any propri-
ip of the axles in question. Were
's axle christened Collinge's, and
ge's axle christened Birch's, my
n would remain the same, be-
unded only on my judgment of
nical superiority and inferiority.
dgment *may be wrong, but* of that
my readers must judge; and if I show any want of candour, I am open to conviction. The hint that I am partial to Collinge is baseless—it is merely his axle which I approve; and I have distinctly stated that Mr. Price and many others make axles of the same kind, equally good, at a much lower rate. Only, as there is rubbish in the market, those who understand not the matter must pay the price of verification. But even supposing I were prejudiced in favour of Collinge, that could clearly do Mr. Birch no harm, since "his invention has been so favourably received, as to defy alike competition and malice!"

To conclude: I hope "Birch Rod" will find this statement a more efficient linch-pin for a jam than the one in his "*susceptible* single nut." But should he be disposed to continue the contest, though I cannot promise that he shall extract birch-w(h)ine from me, I will do my best to make his Birch syc-a-more (sick of more.)

I remain,

Yours very truly,

JUNIUS REDIVIVUS.

Dec. 21, 1834.

P. S.—I perceive the "Red Rover" has been at more patent quackery, in the "revolving-engine" line, and has appointed Mr. Alexander Gordon puffer in ordinary. In the description of the advantages, No. 6 is remarkable.

"The working of the revolving-engine, in a steam-vessel, is much more pleasant to the passengers, by the absence of tremor, now occasioned by the alternating of a ponderous mass of moving matter, twice in every stroke of the engine."

Pray, how were the forty tons of moving matter, in the form of quicksilver, intended to act? "A tarnation-considerable-some of tremor, I calculate."

If I am not misinformed, there was a "trial vessel" for this revolving engine. She had done some service as a kind of lighter on the Thames, and was quietly preparing for decomposition, when the engine wooed her to its embraces. Poor thing! how she must have been astonished, when the "biler busted fust go." On a second trial, there were strong hopes that she might prove wondrous agile as an opium

smuggler on the coast of China, and down the river she went—

Heave the log!
Seven knots!
Heave the log!
Six knots!
Heave the log!
Five knots!
Heave the log!
Four knots!
Heave the log!
Three knots!
Heave the log!
Two knots!

Shove on more coal, and get her steam well up!

Aye, aye, sir!
Heave the log!
Three knots!
Heave the log!
Two knots!
Heave the log!
One knot!
Heave the log!
Half a knot!
Heave the log!
No go!!!!

"Good morning to your lordship; she seems a beautiful craft, but, we fear, she will not be *quite* swift enough for the service of Huggins, Dubbins, and Co., in the China opium smuggling trade. The junks would outsail her! Steamer, ahoy! passengers for the Tower! You can *tide* her back again, captain."

Erratum.—Page 105, in the article on Axletrees and Axle-friction, for "the wheel is 5 feet 6 inches in diameter," *read* "3 feet 6 inches in diameter."

PHILOSOPHY OF VEGETATION.

Sir,—In continuation of the remarks on vegetation, to which you were kind enough to give a place in a recent Number of your Magazine, I proceed to examine the phenomena which take place after the young plant has been developed from the seed.

As the food which has been imbibed by the root must necessarily have been in a fluid state, some important changes, it would appear, must be produced on it after its absorption, in order that it might produce in each plant its own peculiar substances. From this reasoning may be inferred the existence of certain juices continually ascending from the roots; now *during vegetation* there actually is such an ascending fluid, well known by the name of sap or lymph.

Could we collect this fluid in a state of purity, we should, by analysis, be able to obtain a correct notion of the real food of plants; but it is impossible to do this before it becomes mixed with the other juices; the less progress, however, vegetation has made, the purer may we expect to find it.

It is not improbable (observes Dr. Thomson) that the food, after it has been imbibed, may be modified and altered by the root, and that the root may also throw out some part as excrementitious. The circumstance that some plants will not vegetate well after others; and, again, that some grow unusually well in ground wherein others have been vegetating, certainly favours this idea.

The experiments of Mr. Knight would tend to prove that plants, after having arrived at their full growth, are employed, during the latter part of the summer, in preparing food for the buds and blossoms of the succeeding spring, and that this food is deposited in the albumen. This ingenious physiologist found that the density of the sap increased as it mounted in the tree; that of the sycamore and birch, when extracted from close to the ground, had no taste, while at some height it became sensibly sweet, and the sweetness increased with the distance from the ground—a direct proof that something had been gained during the passage.

Every body must have observed the force with which this sap ascends at the bleeding season. Dr. Hales tells us that it issued on one occasion from a vine branch with such an impetuosity, that it supported a column of mercury 32½ inches high!

This fact precludes the idea of the rise of the sap being caused solely by capillary attraction; for if we make an experiment on a glass capillary tube, we shall find that if, after the liquor has risen to its greatest height, we break it an inch or two from the bottom, none of the liquid in the under part will flow over. How, in fact, could it? For this peculiar species of attraction is a certain affinity between the particles of the liquid and the tube; the liquid does not rise by the attraction of the *whole* tube, but of a slender *film* of it; the action, therefore, of all the other films of which

e may be composed, except the one, will be nothing at all. When e is full, the upper film having as an affinity for the liquid as the ne, and having no part above to balance this attraction, retains it. n, the rise of water in a capillary s a certain limit, as the particles uid are infinitely small; when, e, the tubes are above a certain however small their bore may be, ill be no rise.

iologists, in consequence of these ave been obliged to search for her reason for the rise of the sap; as Saussure who first suggested a good explanation of the man- which it rose by the *irritability* of els. He says the sap enters at remity of the root, and that it lled towards the top of the plant *traction* of the vessels nearly re- g that of the muscles of animals. ent experiments by Fontanes, b, and others, give great plausi- this theory.

n the sap has arrived at the a large quantity is thrown off by tion, and the quantity of moisture l by the plant depends on the y thus transpired: and that this ation is principally performed by er surface of the leaves, the ex- ts of Duhamel and others have vident, as they found it may be stopped by varnishing that sur-

transpired matter Hales found to e pure water; what remains must refore, very different in its pro- from the original sap.

of the principal properties of s that of their extracting carbonic m the atmosphere, for the use of t. This discovery was made by estley (see on Air, vol. iii.); but erence he drew from his experi- as, that carbonic acid is destruc- egetable life (vol. i. p. 100). It however, beyond the reach of sett'ed, that carbonic acid is used by plants.

decomposition of this gas is ef- according to Sennebier, by that yer of the bark which lies imme- under the epidermis, called the yma. This philosopher has also that the emission of oxygen, lants are exposed in jars of water to the sun's rays, does not take place unless the fluid holds carbonic acid in solution, and that the more of it there is present, the greater the quantity of oxygen produced.

Plants vary in the quantity of this acid they absorb; the quantity depends on their surface; *thin* leaved plants absorb more than those that have thick leaves. It appears also, that a considerable portion of the oxygen obtained by its decomposition is retained by the plant. —(Saussure.)

As plants rather injure than improve air in the dark, it is probable that the agency of light is requisite to effect the decomposition of carbonic acid. It has long been observed that flowers are injurious in a bed-room during the night. The experiments of Dr. Ingenhouz offer a satisfactory explanation of the cause; for he has found that the whole of the oxygen absorbed by the plant is taken in at night.

There is reason, says Dr. Thomson, for supposing that the oxygen gas thus absorbed by plants is converted into carbonic acid within the plant, and that it is only after the plant is saturated with this acid that the surrounding oxygen is partly converted into carbonic acid, by its union with the carbonaceous matter of the plant.

An extraordinary instance of heat being evolved during the bursting of the stamina of plants, is related on the authority of Huber. The plant in which the phenomena was observed was the arum cardifolium, by the bursting of twelve of which sufficient heat was produced to raise the thermometer from 79° to 143° Fahr. Whether this was in any way connected with the absorption of oxygen, was not ascertained. The leaves of plants absorb water as well as oxygen from the air; and what is rather a singular fact, the absorption is performed by *different organs*, and on the opposite side of the leaf from those which emit moisture.

Upon the whole, the office of the leaves of plants seem to be this; viz. *that during the day-time they are emitting moisture and oxygen, and absorbing carbonic acid; while on the other hand, during the night, they are employed in absorbing moisture and oxygen, and emitting carbonic acid.* But the quantities of acid absorbed during the day, and emitted dur-

ing the night, are not equal: it has been proved that the oxygen given out much *more* than balances the quantity of carbonic acid (Ingenhouz, Sennebier). Hence a double end is accomplished—the purity of our atmosphere is preserved, and the carbon of the plant increased.

We can thus form some idea of the very great importance of leaves. They have been compared to the stomach and lungs of animals, and may be considered as the digesting organs of plants; by them the *peculiar juice* of each plant is formed; without them the plant must perish.

Of the exact nature of this peculiar juice we know nothing; it is evidently conveyed to every part of the plant, and the organs themselves, by which they perform their functions, are formed from it; but, as Dr. Thomson says, the thickest veil covers the whole of these processes, and so far from removing it, philosophers have never yet been able to approach it; all the operations are probably chemical, but we know neither what they are, nor by what agents they are regulated.

I am, Sir,
Your most obedient servant,

Bath, Dec. 19, 1834. A.

MERCURIAL GAS-HOLDERS.

Fig. 1.

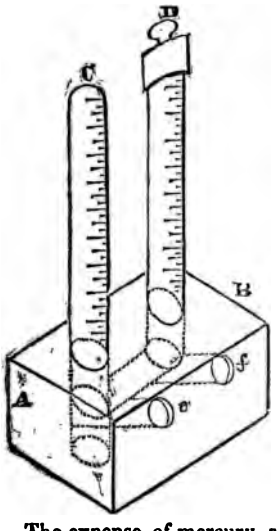


Fig. 2.

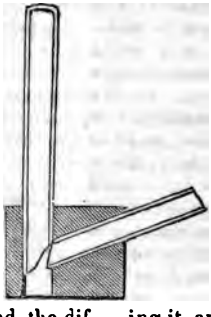
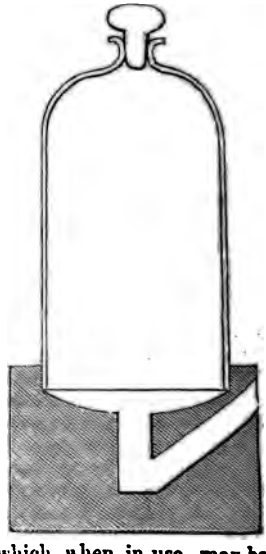


Fig. 3.



The expense of mercury, and the difficulty of manipulating at the mercurial trough, have the effect of confining that instrument to the laboratories of public institutions; any suggestions, therefore, for diminishing the requisite quantity of mercury will not be unacceptable.

A B is a solid block of mahogany, six inches long by four broad and three deep; C D are two tubes, firmly cemented into the block, and communicating with each other. There is an aperture under C, for the purpose of cleaning it, and which, when in use, may be closed with a sound cork.

The mode of using the instrument is this:—When it is desired to collect a gas absorbable by water, the apertures *e* and *f* are to be corked, and mercury is to be poured into the tube D; of course C is full of air, but by elevating the end B of the instrument, the air may be readily made to pass out of C, and its place supplied with mercury, when the cork at *e* may be withdrawn, and the mercury will be retained in the tube by the pres-

sure of the atmosphere. The beak of a retort or tube, delivering gas, is now introduced into *e*; and should it be desirable to measure the quantity precisely, the cork being replaced at *e*, mercury is to be poured into D till it stands at the same height in both tubes: should it now be desired to examine the gas in C, as to its inflammability, acidity, &c., the tube D is filled with mercury, the end B elevated, and a few bubbles allowed to pass into D, when, on removing the stopper, a taper may be introduced. Or, D may be partly filled with solution of caustic, potash, or other appropriate test, on which it is desired to observe the action of the gas.

If two gases are to be mixed in certain proportions, C and D are filled with the requisite quantities, *e* and *f* are then corked, and the mixture instantaneously effected.

Dr. Faraday, in his excellent work on Chemical Manipulation, page 410, has figured a bent tube as a convenient mercurial receiver, in examining small quantities of gases. Now, as glass apparatus is not obtainable out of the metropolis, and there is expensive, I have given, in fig. 2, a section of an instrument which any one may make, and which has the great advantage over the bent tube, of not being liable to be overturned. The two tubes are cemented into a small block of wood, the aperture *g* being closed with a cork. The upright tube having been filled with gas, and the retort withdrawn, a little mercury is to be poured into the open tube, so as to fill it, and it is then to be closed accurately with the finger. The instrument is then held so as to allow a bubble or two of gas to pass up to the finger, and to be then examined by any requisite test.

Whenever it may be desirable to operate upon larger quantities of gas, the use of the mercurial trough may be still avoided, by having an air jar fixed into a block of wood, as seen in section at fig. 3; the wood is hollowed to allow the mercury to drain off, and it would perhaps be as well if the aperture to admit the gas were nearer to the side of the jar, instead of being in the centre, as represented. An air jar that may have been broken at the bottom, or a glass bottle with the bottom out, answers very well for a gas-holder of this description. I think this gas-holder will be found convenient for collecting chlorine, as the whole of the water may be expelled, except the small quantity remaining in the orifice, and therefore there will be little absorption; and the air jar requiring no transfer tray, all risk of any accidental escape of this suffocating gas is prevented. A convenient gas-holder for chlorine is figured, vol. viii. p. 410, of this Magazine.

The idea of fig. 1, I took from Mr. Weekes's portable eudiometer, figured in a recent number of the Mech. Mag. It is unquestionably the best eudiometer yet invented. It occurs to me that the mixed gases might be introduced as readily by means of an orifice as at *e*, I am making an instrument on this plan, chiefly because I fear to spoil my eudiometer, by attempting to drill a hole through its crown; and partly, because I think Mr. W.'s stop-cocks objectionable, when exposed to the action of mercury. Should I find the explosion blow out my cork at *e*, I shall be obliged to resort to his plan.

It gives me great pleasure to see the accession the Magazine has lately obtained of scientific correspondents, and, among others, ω. of Bath. The Magazine is invaluable in collecting the communications of distant observers, and promoting the advancement of knowledge and happiness.

HENRY WATSON.

Chichester, 12th Month 18, 1834.

PORTLAND BREAKWATER.

Sir,—In consequence of Mr. Lamb's continued remarks, dated 17th Nov., 1834, in No. 589 of your esteemed work, I have examined my late father's books and papers, and gleaned from them the following historical details of the origin and progress of the plan of the Portland breakwater:—

The plan was designed and matured as early as 1794.

Between that period and 1814, a manuscript copy of "Remarks," by my father, pointing out the advantages of the plan, was shown to and read by a great many persons; and in 1814, these "Remarks" were printed, and 400 copies distributed.

On the 11th Nov. 1813, a Report on the proposed breakwater, with a drawing of

Portland, Weymouth, &c. &c., was sent by my father to Christopher Idle, Esq., M. P.

Later in 1813, Mr. George Dodd, engineer; Mr. Dessiou, nautical surveyor; Mr. Lamb, solicitor; Mr. Idle; Mr. John Harvey, sen., and his son, Mr. Jas. Dunning Harvey, were engaged many days in surveying the coast, bay, and shambles. Shortly afterwards, Mr. Dodd again came to Weymouth, and Mr. Harvey, sen., accompanied him to the high land at Portland.

In 1814, Mr. Harvey's plan of a breakwater in Portland-roads was laid before Lord Melville. His lordship fixed on a day for visiting Portland from the Isle of Wight, but owing to the sudden death of the engineer, who was to accompany his lordship, on the very morning of the day intended for their departure, the visit did not take place.

June 14, 1814, Mr. Harvey, sen., made a report on the subject to Samuel Watkins, Esq., Trinity Wharf, Rotherhithe, accompanied by a plan of Cherbourg, Lulworth Cove, Weymouth town and harbour, Portland and the bay, the proposed line for the breakwater, part of the English channel, with the bearings of the port of Cherbourg, from Portsmouth, Portland, and Plymouth, by Mr. James Dunning Harvey. In this Report he observed, that the line for the breakwater therein proposed, differed in length from that proposed by Mr. Dodd by about a quarter of a mile;—"HIS was to extend 2 miles, but THIS (meaning the original one) is TWO AND A QUARTER MILES," &c.

Aug. 23, 1818, Mr. Idle, in a letter to Mr. Harvey, sen., observes—"With respect TO YOUR PLAN of a breakwater in Portland-roads, I would advise you," &c.

Sept. 25, 1818, Mr. Idle, in a letter to Mr. Harvey, sen., communicates the following extract of a letter addressed to him by Mr. Lamb:—"That he had been at considerable expense in collecting materials, and had still his eye upon the plan, if a favourable opportunity offered to renew the prosecution of it; but that he had made up his mind to wait and see what happened in the new parliament, but that this resolution was defeated by Mr. Dodd calling on him the other day with a letter from Mr. Henning, and a memorial signed by some of the inhabitants of Weymouth, proposing the immediate prosecution of the measure; and intimating, *that if he did not insert the requisite advertisements they should apply to some other person:* this induced him, he says, to insert the advertisement,* more as a precautionary measure, than as one founded on any definitive plan previously settled."

* Vide *Sherborne and Yeovil Mercury*, September 13, 1813.

I subjoin a copy of a letter which I have lately received from Capt. Jos. Bennett, on the subject of my father's claims:

Weymouth, Dec. 10, 1834.

Dear Sir,—I beg to assert, without fear of contradiction, that your late respected father most certainly was the original projector of a breakwater for Portland-roads. I had frequent opportunities of knowing this to be the case. The loss of Admiral Christian's fleet, in Nov. 1795, together with the advancement of Cherbourg, led him, no doubt, to study and improve his original idea of 1794, and to give his remarks verbally as well as in manuscript, and afterwards in print, to the public.

I am truly rejoiced at your continual zeal in the promotion of so national an object; the public have in consequence become impressed with its great importance, and, together with myself, look for its speedy adoption. I am, dear Sir,

Yours truly,
JOSEPH BENNETT.

I trust that no doubt can now remain as to my late father being the sole originator of the project. That I should feel anxious to vindicate his claims to it, and continue myself to take a deep interest in its prosecution, is due as well to his memory as to my own strong conviction of its vast national importance. The plan, too, is intimately connected with another of great utility, namely, a railroad from Weymouth to Bristol, which, in the event of the breakwater being constructed, would ere long make Weymouth one of the first ports in the south of England.

I am, Mr. Editor,
Respectfully,
Your obliged,
JOHN HARVEY.

Weymouth, Dec. 16, 1834.

THE HIMALAYAN MOUNTAINS—INDIA AND ITS CAPABILITIES.

Among the important additions to modern geography, which date from the commencement of the present century, may be ranked nearly all the correct knowledge we possess of that vast chain of mountains which bounds our East Indian empire on the north and west. Till the publications of Colebrooke, Moorcroft, Gerard, Herbert, and other recent travellers, we knew little of the Himalayas beyond their name; they were

ıely lofty, but how lofty no one could capped in eternal snow, but to extent inhabited, or inhabitable, what natural productions distin-ıd, was mostly matter of conjec- The Alps and the Andes were ually supposed to be the highest its in the world; and from them, ıt we knew of the phenomena of ı at extreme elevations was derived.

ı acquisition of information respect-e loftier Himalayas—for loftier, as all presently see, they undoubtedly ıas been much aided by the Bo-garden established by the East Company at Saharunpore. It is ed about a thousand miles to the -west of Calcutta, nearly at the of the immense plain which forms illey of the Ganges, and within 30 of the commencement of that succes-f mountainous ranges, which pass the general name of the Himalayas. have been collected from time to ıot only those specimens of the na-productions of the surrounding ries, brought hither by the Euro-servants of the Company commis-l to explore them, but as many nens as could be obtained by a ious liberality from native mer-s and collectors. The Herbarium s Garden contains about 3,500 dif-; species; and of these the *Alpine* it might with equal figurative pro-be now called the *Himalayan*) ın is, if not the most numerous, by ıe most interesting, and probably complete.

. J. Forbes Royle, late superinten-of this Garden, has now undertaken mportant task of arranging and odising, for the information of his oyers and the public, so much of reat store of materials here col-l, as relates to the Himalayas. ıodestly styles his work*—four parts hich are now before us—"Illustra-" merely of "the Botany and Branches of the Natural History e Himalayan Mountains;" but it presents in truth a most systematic and complete view of the natural history of those regions, which, though the first that has been given to the world, will probably long remain the best. Mr. Royle has brought to the execution of his task all the essential qualifications of a good naturalist; an ardent love of his subject, and thorough acquaintance with whatever has been published upon it—a keenly observant mind—habits of great exactness and unwearying indus try—and a spirit of generalisation, which while it disdains not the toil of elaborating details, values results only in so far as they can be made of practical use to his country, or to mankind. His work, accordingly, instead of being one to be prized by mere botanists or zoologists, is likely to have its warmest admirers among that politico-economical class, whose principal care is how to increase the "wealth of nations." Were it not, indeed, for the expensive form in which the work has been produced, in consequence of the number of large plates necessary for the illustration of the text, its contents are of so generally interesting a nature, that it could hardly fail of obtaining a very extensive share of popularity.

Although the Herbarium at Saharunpore has supplied the greater number of the specimens figured and illustrated in this work, Mr. Royle acknowledges considerable obligations to other sources. The magnificent Herbarium, formed by Dr. Wallich (of the Calcutta Botanic Garden), and presented by the East India Company to the Linnæan Society, "has been constantly consulted, for the purpose of showing either analogy or difference in the vegetation of different portions of the Himalayas." A number of unpublished drawings, by Dr. Wallich, have also been liberally placed by Dr. Wallich at the disposal of Mr. Royle, "for the purpose of selections being made for the present work." Major-General Hardwicke, too, has "placed in the author's hands ten volumes of drawings made in the plains of northern India, and also while travelling, near 30 years ago, in the Himalayas." The number of figures borrowed from these collections, however, is not as yet great, and they are, in each case, duly acknowledged.

The drawings made from the Saha-

lustrations of the Botany and other Branches Natural History of the Himalayan Mountind of the Flora of Cashmere. By J. Forbes Esq., F. L. S. and G. S., M. R. A. S., Hon. East India Company's Medical Estaent, late Superintendent of the Hon. Com-Botanic Garden at Saharunpore. 4to. I. II. III. and IV. 1834. Black, Parbury,).

runpore collection, were executed under Mr. Royle's own immediate superintendence by "the Hon. Company's painters, who, during Dr. Wallich's absence in England, were, by the orders of the then Governor-General of India, the Earl of Amherst, sent from the Botanic Garden at Calcutta to that of Saharunpore." While admiring, therefore, the manner of their execution—which is in general extremely beautiful—it is satisfactory to know that we may place every reliance on their fidelity to nature.

Of the common habitat of the specimens described—the Himalayan mountains—we have the following interesting description:—

"The Himalaya, Himmaleh, Himachal, or snowy mountains, remarkable for their extent, are not less so for their elevation. Seen from Kurnaul, near north lat. 30°, or from Patna, 5° more to the southward, and from both at a distance of about 150 miles, these stupendous mountains present over 15½° of longitude, a long line of snow white pinnacles, which, on a nearer approach, are seen towering above the dark line of lower but still lofty mountains. Those which are seen at the greatest distance, being situated within the Chinese boundaries, and only approachable through the territories of Nepaul, still remain unexamined, as the Ghoorkhas have adopted the Chinese policy of excluding all strangers from their kingdoms. Dhawalagiri, or the white mountain, supposed to be situated near the sources of the Ghunduc river, in its early course called Salagrami, from many of the stones containing remains of Ammonites, is stated by Mr. Colebrooke as a mean of the two nearest observations to be elevated (allowing one-eighth for refraction) 26,462 above Gorukhpore, or 26,862 feet above the level of the sea; but allowing one-eleventh for refraction, 27,551; and from the mean of three observations, and with middle refraction, the whole height is more than 28,000 feet above the level of the sea. Chamalari, near which, after traversing Bootan and crossing the frontier of Tibet, Captain Turner and Mr. Saunders passed on their journey to Tesboo Loomboo, is the same mountain, in their opinion, which is seen from Purnea, Rajmahl, and other places in Bengal, the most remote of which is distant not less than 232 English miles. This, as Mr. Colebrooke states, requires an elevation exceeding 28,000 feet, to be barely discernible at so great a distance in the mean state of the atmosphere, though much less elevation may suffice under circumstances of extraordinary refraction. Mr. Moorcroft was of opinion, that some of the peaks which he saw on his journey to Lake Manasarowur were elevated at least 30,000 feet; one of the surveyors in Kunawur, from the angles of altitude which he obtained from the crest of a pass elevated 15,000 feet, thought some of the peaks he saw to the northward could not be less than 29,000 feet: and more recently, Dr. Gerard, from some observations at great—barometrically—ascertained heights, inferred that some snowy peaks which he also saw to the northward could not be less than 30,000 feet above the level of the ocean. Those latter are only mentioned in conjunction with the former, as indicating the probability of the highest pinnacles being still to be ascertained in the Kailas portion of the great Himalayan range.

"Fortunately we do not depend upon these approximations only for a true estimate of the height of the Himalayan peaks. These mountains have been so carefully and scientifically surveyed from the Sutlej to the Gogra by Captains Hodgson, Webb, and Herbert, and with a bias apparently to take the lowest rather than the highest results which their observations gave them, that it would not perhaps be advancing too much to say, that if they err, it is rather on the side of deficiency than of excess. * * * Captain Herbert, speaking only of the surveyed portion of these mountains, has justly observed, that 'whilst in South America, there is but one peak, Chimborazo, which exceeds 20,000, and not more than five which are about 18,000, there are no fewer than 28 peaks on the Himalayas which overtop Chimboraze, one of which is above 25,000 feet; forty-four which exceed the three next of the American elevations; and more than a hundred which tower above the next in height: facts more satisfactory as proofs of the superior elevation of these mountains, than the greater loftiness of an isolated summit.'*

On descending the western passes of the Himalayas, the traveller enters Kunawur—a country, comprehending the valley of the Sutlej, and its principal feeders, between 31° 31′, and 31° 51′ north latitude. The climate and productions of this part of the chain are distinguished by some very remarkable peculiarities.

* "These remarks were made previous to our being informed that Mr. Pentland had measured some peaks in the Andes, which were more elevated than Chimborazo, as the Cerro Nevada de Illimani, 24,350. and the Cerro Nevada de Sorata, 23,250 feet above the sea, both in the Eastern Cordillera of Bolivia; but as these are only isolated summits, Capt. Herbert's inferences apply with nearly equal force, particularly as a multitude of peaks extending over several degrees of latitude and longitude are in his estimate."

a late journey through the *north-*
parts of Kunawur, Dr. Gerard writes,
he came upon a village at a height of
feet. It was the middle of October,
ie thermometer on two mornings was
t the sun's rays were oppressive; and
streams and lakes, which were sheeted
ce during the night, were free and
g by two o'clock. The finest crops
ley are reared here, and to irrigation
lar heat are the people indebted for a
The barometer gave for the highest
14,900 feet of elevation. I think it
probable that crops may vegetate at
and 17,000 feet. The Yaks and
goats seemed finer than at any other
ithin my observation.' Further on
tinues:—'On the north-eastern fron-
Kunawur, close to the stone bridge
o Changrezing), I attained a height of
han 20,000 feet without crossing the
the barometer showing 14,320, ther-
er 27°, at one P. M. Notwithstanding
levation I felt oppressed by the sun's
hough the air in the shade was freez-
—p. 36.

ain:—

we turn our attention to the west-
f Kunawur, we witness a repetition of
me appearances. A road leads from
num, up the bed of the Dabrung, to
and Dunkur, over very elevated
. Dwarf pines are noticed at 10,000
fields of beans, and orchards of apri-
are passed through at a considerable
ion, and towards Pamachee a belt
hes, at 14,000. Here a juniper, called
is used as fuel. On this road the
rang pass is elevated 18,612 feet, the
alf mile covered with perpetual snow;
me stunted vegetation is observed at
se of the mountains. At sun-rise
ermometer stood at 31°, and must
been lower during the night, for the
ts of the Messrs. Gerard were tough as
r. In proceeding towards Manes they
bushes and wild leeks at 15,000 feet,
ssed over gravelly hills, covered with
bushes, and found cultivation of wheat,
, and oats, at 12,000 feet above the
f the sea. The grain was almost ripe;
ere were a few poplars, and some bar-
and other bushes in the vicinity. At
, elevated 11,950 feet, the temperature
d on the 1st of September from 52° in
orning to 81° at the hottest time of
y. One of the surveyors, in a letter
hed in the Asiatic Journal, for May,
p. 629, gives a most animated ac-
of the excessive rigour of the climate at
mmencement of winter in these regions,
the fierceness with which the sun's
rt through the rarefied air of greatly
elevated regions, so as to produce a feeling of scorching in the midst of almost unbearable cold. Of this may be adduced as instances, that, at the foot of Dunkur, elevated 13,000 feet, while the temperature of the air was 32°, a thermometer in the sun rose to 126°, and the inhabitants were then enabled to keep themselves comfortable on the roofs of their houses even in winter. At Rangreek, elevated 12,500 feet, the thermometer fell to 6° during the night, and rose at eleven in the forenoon only to 20°; and yet the greatest inconvenience was experienced, as well from the dazzling reflection from the snow as from the great power of the sun's rays; the latter made more sensible by the sharp chill of the air, which was never heated beyond 25°. Towards evening a sudden gust of piercingly cold wind *destroyed several of their followers*, the breath of the travellers congealed upon their beards, and their clothes grew stiff upon their backs. In fording a stream the water froze as fast as it touched them, until their legs and feet became stiff as wicker-work. After a fresh and heavy fall of snow the weather became settled and serene, but the cold increased so much that the thermometer fell 2° below zero; and yet in such regions as the valley of the Peenoo, there are villages and cultivation at not less than 13,500 feet of elevation, and not far distant poplar trees 12 feet in girth."—p. 38.

Mr. Royle's explanation of the cause of these curious phenomena is clear and satisfactory:—

"From the details which have been given, it seems abundantly clear that the elevation of the Indian snowy range is sufficient to prevent the passage across of the cloudy masses which deluge the plains of Northern India with rain, both in the cold and in the warm season. The atmosphere, therefore, on the northern face of the Himalayas, preserves unimpaired the dryness which is the characteristic of the rarefied air of lofty situations; hence the little deposition of snow which takes place in winter, in proportion to the lowness of the temperature. The returning warmth of spring rapidly dissolves the thin layer of snow from level places, in consequence, it appears, of the undiminished power of the solar rays in passing through so rare and transparent a medium: a fact tending to confirm Mr. Daniel's views respecting the superior energy of the solar rays in the higher regions of the air; and as this seems already to have been done, with respect to his opinions of their great power in polar regions, the fact is interesting, as giving an additional cause for the analogy between alpine and polar vegetation. When the snow is once melted, these elevated

tracts, surrounded and confined by towering mountains, absorb heat as readily during the presence of the sun, as they radiate it freely while he is absent, and becoming like the surface of the earth at ordinary levels, the source whence the heat received from the sun is diffused to surrounding objects, they cause the line of perpetual congelation to recede higher and higher, in proportion to their own elevation. Peaks and pinnacles, on the contrary, projected into the air, like promontories into the ocean, partake rather of the equality of temperature of the medium into which they intrude, than impress on them, like plains and table lands, their own extremes of heat and cold."—p. 39.

The district of Cashmere, which Mr. Royle says "can only be considered as a valley of the Himalayas," has had its claims to the beauty for which it has been so long renowned, disputed by the late unfortunate French traveller, M. Jacquemont, but Mr. Royle thinks on insufficient grounds.

"The valley of Cashmere, situated between the thirty-fourth and thirty-fifth parallels of latitude, in the most northern part of the Himalaya, and to which we descend from the snow clad summit of Peerpunjal, is described as being of an oval form, encircled by mountains clothed with vegetation, which are themselves girded by a higher range covered with snow. The level of the valley is of considerable extent, being about sixty miles in length, and about forty in breadth, in the widest part; its elevation is estimated by the late lamented traveller, M. Jacquemont, to be from 5,248 to 5,576 feet: he, however, states, that the beauty of this valley has been much exaggerated both by his countryman, Bernier, and by Mr. Forster. But there is no doubt that in consequence of its being copiously watered by numerous streams, lakes, and canals, there is considerable moisture, both of soil and climate, and almost constant verdure; while the numerous gardens, and the great variety of fruit trees and of beautiful flowers, must always strike visitors from the arid plains of India, whether Europeans, as Bernier and Forster, or Asiatics, as Abul Fazl. From the mixed nature of the cultivation the climate must evidently be mild and temperate; for even in the warmest months of summer, the breezes, which descend at night from the mountains, are always cool and pleasant: the periodical rains consist of gentle showers, and the snows which fall in winter cannot remain long upon *the ground. Abul Fazl* says that it rains *and snows here at the same season, as in Tartary and Persia;* and that during the *periodical rains in Hindostan,* light showers only fall here, though with great violence on the mountains which form the barrier to the south-east."—p. 27.

We should now, were inclination our guide, proceed to extract largely from Mr. Royle's "Illustrations" of the vegetable and animal tribes of these various regions,—from those, in particular, that relate to the cultivation of the tea and cotton plants, respecting which the author has furnished much original and valuable information; but we have not more than room left for the following general summary of the productive capabilities of our East Indian empire, and our humble but earnest recommendation of it, to the serious attention of all who are in search of a practical solution of the difficulties in which the country is supposed to be involved, from a disparity between the numbers of the people and their means of subsistence. Immense as is the wealth which Great Britain has derived by force of arms, from her Asiatic conquests, we share in the conviction of the author (indicated, however, rather than expressed), that it is all as nothing compared with what she may yet obtain by a peaceful, judicious, and persevering cultivation of their natural resources; and prodigiously numerous though the native population be, which these regions have to sustain, we feel persuaded that, were twice as many of our countrymen to emigrate thither as are ever likely to take advantage of the facilities of settlement, afforded by the recent abolition of the Company's monopoly, they could not reap more benefit than they would be certain to confer. To add one Englishman to every 500 Hindoos (providing always that he be not of the sword and spear, but of the ploughshare and pruning-hook class) would not be to add to the number of mouths and leave the ears of corn as they were, but to cause two ears to grow where only one grew before.

"No where is the field more extended, and at the same time more favourable for acclimating the useful productions of different countries. In the Peninsula of India, and in the neighbouring island of Ceylon, we have a climate capable of producing cinnamon, cassia, pepper, and cardamoms. The coffee grown on the Malabar coast is of so superior a quality as to be taken to Arabia, and re-exported as Mocha coffee: the Tinnevelly senna brings the highest price in the London market; and there is little doubt that many other valuable products of tropical countries

acclimated, particularly as several are in a flourishing condition in the Bo-arden at Calcutta—such as the cocoa :meg, as well as the camphor, pimento, , and cashew-nut trees. In the Neil-s a favourable soil might, without be found for the cinchona, as well as erent kinds of ipecacuanha; and as ato has been introduced into almost art of India, equal success and consi-benefit would probably result from icing the different kinds of arracacha, h prized for their roots, as food for ives of South America.

long the coasts of the Bay of Bengal coa and areca-nut palms flourish and ; and the continent every where pro-indigo, cotton, tobacco, sugar, and

The first, hardly of any note as an product thirty years ago, is now im-in the largest quantities into England. tton, though indigenous to India, has en in any way improved, though many ces seem peculiarly well adapted for lture, particularly Malwa and those to rth-west. The tobacco brought home . Wallich from Martavan, was pro-ed by competent judges in England to ual to the best from America; while rsian tobacco, the produce of a peculiar , the *Nicotiana Persica* of Dr. Lindley, ebrated, and commands a high price in India and Europe. This, there is probability in considering, would suc-ithin the north-west provinces, which arest its native country. The opium of is preferred in China; and that of bids fair to rival Turkey opium in uropean market. The sugar cane is ated in every part of India, but very or sugar has hitherto been produced: , however, a manufactory has been es-ed near Calna, a new mine opened in urdwan coal-mine formation, and very or specimens of sugar sent home. the occurrence of sugar at the surface soil, and coal only a few feet below it, ountry where labour is so cheap, ought attended with decidedly favourable s. If from these we turn our attention er products, we shall still see that there reat capacities even where we should expect them: for though India is gene-looked upon chiefly as a rice country, has been imported into and sold at a in England from the northern provinces; lour for making starch is now one of the al exports from Calcutta. Of dyes, medi-drugs, resins, and gums, there are great ties; and more might be successfully duced. Timber of every kind is every *abundant, the coasts producing teak, and many others; the interior, saul, bamboos, and rattans;* while a great variety of plants, though but little known, yield excellent material for cordage.

"The northern provinces and the hills, forming the more immediate object of this work, will be more fully considered in the sequel: it is sufficient at present to observe, that at one season they grow European grains, and at another those which are peculiar to the tropics; and that many perennials of both these two climates seem to succeed equally well in the northern provinces of India: here, therefore, many of the useful products of Persia, Arabia, and Barbary might be grown."

* * * * *

"The hill provinces enjoy nearly similar advantages; the forests are formed of oaks and pines, and the hill-men make their strong ropes for crossing rivers with hemp, which every where abounds, and is of the finest quality. Opium, rhuburb, and turpentine, form articles of commerce; as well as musk, Thibet wool, and borax, from the other kingdoms of nature.

"Somewhere in the valleys at the foot of these hills, or at moderate elevations, the more generally useful productions of European countries might be successfully introduced, as the olive and the hop; the latter would be particularly beneficial, as a brewery has been established on the hills, where the climate is excellent.

"Here also, as I have recommended in a report to government, there is considerable prospect of success in the cultivation of the tea-plant; for the different elevations allow of every variety of climate being selected, and the geographical distribution of this plant is sufficiently extended to warrant its being beneficially cultivated.

"The above few examples will be sufficient to show that in the climates where these varied productions grow, others from different countries may be successfully introduced. It is not to be expected that equal success will attend every attempt, but where so many circumstances are favourable, there is little probability of failure in many, if the proper means are adopted for ensuring success; and these consist chiefly in supplying to one country our knowledge of the climate, and productions of another, where any similarity of circumstances occur; and I entertain sanguine expectations that with moderate attention and proper encouragement, the products of India may be still more varied, almost indefinitely increased in quantity, and very much improved in quality. *Hitherto, instead of endeavouring to call forth the resources of the country, it seems rather to have been wished to repress its energies, by charging upon articles of well-known inferior quality a higher duty, if imported from the East Indies than from other parts of the world."*—p. 4, 5.

NOTES AND NOTICES.

New Steam-boiler.—The Meteor steamer has been fitted up, at Woolwich, with a new boiler, by a Mr. E. Collier, and is to take out the Lisbon mail, for the purpose of trying the effect of this improvement in steam machinery. By Mr. Collier's invention a space of 13 feet will be saved; and when the boiler is filled there will be 15 tons less weight than in the boiler on the old construction. The steam is got up in an hour's less time than heretofore, and with the saving of a ton of coals. The vessel has been tried on the river, and not the slightest doubt is entertained of her success at sea. —*Essex Herald.*

Something Comical.—New Orleans, Sept. 19—Yesterday, the Locomotive Creole of the railroad, being ready to start for the city, with several cars attached, having been left by the engineer for a few moments, started backward with full steam, and safely deposited itself and the cars in twelve feet water at the end of the wharf.

Canals and Railways.—A correspondent of the *American Railroad Journal*, speaking of the ineffectual attempts of the canal proprietors in Great Britain to rival the speed attained on railways, observes (after a handsome compliment to the *London Mechanics' Magazine*, for its "able criticism on Mr. M'Neill's Experiments on Canal Navigation")—"With the power *in* the boat, the same results have not been obtained (showing that it was by the partial lifting of the vessel out of the water, by means of the horses and towing-rope, that the diminution of displacement was occasioned). The experiments with steam-boats altogether failed; and the boat, at present plying as a tug-boat on the Forth and Clyde Canal, and which would have been fitted for passengers had the parties had any confidence in their own assertions, never has realised an average speed of more than six miles an hour, and ordinarily not more than five. If the scheme is in reality feasible—if the results are true, where are the boats? Every exertion has been made by the proprietors of these canals, and the utmost they have obtained is by a boat like a razor, of about 36 inches beam, where the passengers, with threaded legs, are not at liberty to move, lest the boat should upset. With this species of shuttlecock, and relays of horses every five miles, they have gained a speed of nine miles an hour, and yet talk of their discoveries in science, and the superiority of canals to railroads!"

Algerine Cement.—The late conquest of Algiers by the French has made known a cement used in the public works of that city. It is cemposed of two parts of ashes, three of clay, and one of sand. This composition, called by the Moors *fabbi*, being again mixed with oil resists the inclemencies of the weather better than marble itself.—*Betja Flor.*

Steam-Waggon.—In Massachusetts, a steam-waggon, to run on common roads, has been invented. Several trials have proved its efficacy. They intend to endeavour to make it pack and unpack all its packages, and keep its own account of freight!—*American Railroad Journal.*

A Railroad Meeting in America—Extracts from the letter of a traveller through the Michigan territory:—"The house (Marshall Inn.) was not as yet plastered inside; but the bar-room wore already the insignia of a long-established tavern in an old community, and apprised me at once, by the placarded sheriffs' notices, and advertisements for stolen horses, grain to be sold, and labourers wanted, which indicate the growth of business in *country life, that society* was in a pretty mature *state—at least six months old*—in the country town *of Marshall. I was,* therefore not at all surprised *to find among these notices* a call for a railroad *meeting in the evening—especially as nearly* 18 *months* had elapsed since the white ma his cabin in this section of the country. ing, which might be termed a crowded conducted with more animation than u There were several very intelligent me however, and I listened with interest tc positions of the resources of this secti Michigan. The discussion became at la santly warm. 'This pother,' said an ol 'reminds me, Mr. Chairman, of two trap in planning a spearing expedition for day, quarrelled about the manner in whic which they proposed taking, should be c their supper, after the sport of the day An old Indian happily settled the diffi proposing that they should *first catch t* Now, sir, as this railroad——' 'The c at all parallel,' interrupted a still mo speaker, 'for Nature has already caught for us. *She meant the railroad to pass ri here, and no where else.*'"

The Sea Serpent is once more going the the American papers. The *Boston Even nal* says—"We understand that yester noon, about three o'clock, the crew and p of the Portsmouth packet, Capt. Goodri distinct view of the sea serpent, when wi eight miles of Napaul. There seemed doubt among thirty credible witnesses of ence. The monster was about twenty when first seen; and his head, about the barrel, was elevated three or four feet surface of the water. He seemed frighte noise of the boat, and the exclamations o board, and withdrew his head beneath th passing rapidly through the water, at t fifteen or twenty knots an hour. He to be about 100 feet in length."

Will E. H. favour us with the cont We shall then be better able to determi best mode of publication.

E., "on the fallacy of the phrenologica would involve us in an interminable on a subject, which he has but very sc (literally so) examined.

We know nothing of the Institution, w which "A Young Mechanic" makes in

Communications received from Nautil —Mr. White—G. S.—Mr. A. R. Cunn S. K——d—R. B. D.—Anti-Gas.

The Supplement to Vol. XXI., with a on Steel, of the late Mr. Telford, is n Price 6*d.*; also the Volume complete, Price 8*s.*

☞ The Editor of the Mechanics' has made such arrangements as enabl offer, on unusually advantageous terms, take the solicitation of Patents for Ne tions, the drawing and revising of Spec and generally every other branch of Pa ness. Drawings of Machines executed v racy and dispatch.

6, Peterborough-court, Jan. 3, 1835.

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MACERONE AND SQUIRE'S STEAM-BOILER.

Fig. 1.

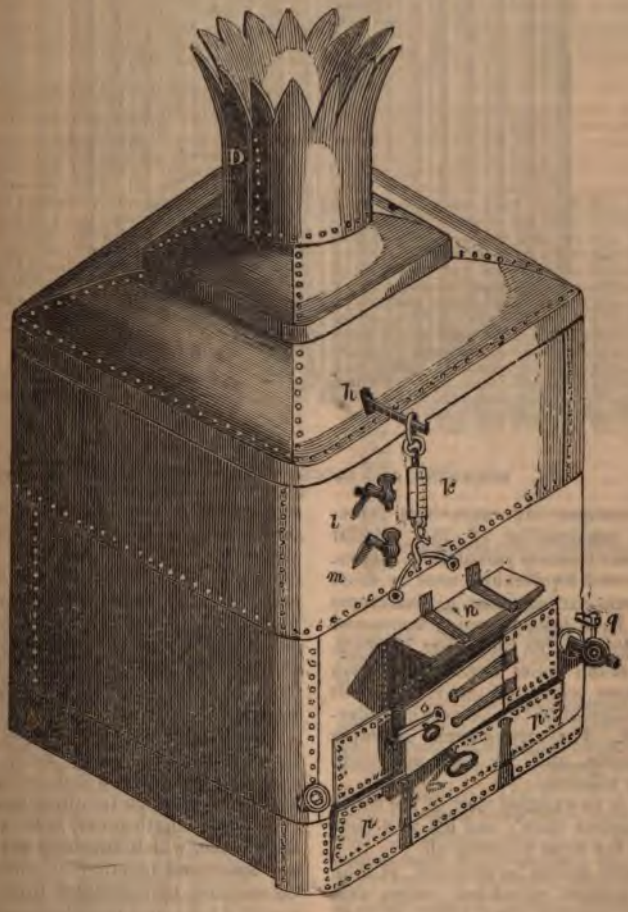
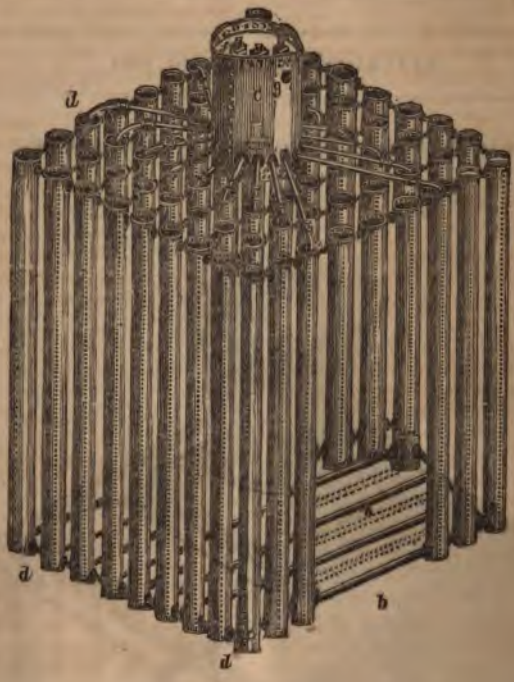


Fig. 2.



MACERONE AND SQUIRE'S STEAM-BOILER.

The accompanying engravings represent the construction of the tubular steam-boiler recently patented by Messrs. Macerone and Squire, and used by them in the steam-carriage, the performances of which have been so much canvassed in the pages of this and other journals. Looking at the boiler itself—apart from the wonders related of the carriage—it must be allowed to possess very considerable merit. The arrangement is simple and ingenious, and, we have no doubt, extremely efficient.

Fig. 1, is an external view of the boiler in its complete state; and fig. 2, a view of it with the outer covering off.

It consists, it will be observed, of nine rows of upright cylindrical tubes, and each row contains nine tubes, so that there are eighty-one in all. The tubes in the front row are of the different lengths represented in fig. 3. The tubes in the back row are all of one length, as seen in fig. 4. The seven interior rows are of the lengths shown in fig. 5. The space (A, fig. 5,) left vacant by the shortening of the seven inner tubes of the seven interior rows, serves for the furnace; and the space (B, fig. 3,) left vacant by the shortening of the three inmost tubes of the front row, gives admission to the furnace.

The tubes are of wrought iron, of about one-eighth of an inch, with the exception of the top and bottom pieces, which are of twice the thickness.

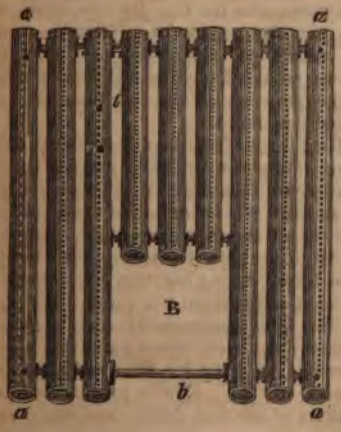
The full length tubes, that is, those on the outside, which surround the furnace, are connected together at their inferior extremities, by horizontal tubes of gun-metal, *b b b*; and these horizontal tubes, with one or more solid bars placed between, serve for the furnace floor.

The whole of the vertical tubes are

connected with one another, both at top and bottom, in the manner represented in the engravings.

C is a steam-chamber or reservoir, which communicates with two cylinders of each of the vertical rows of tubes, by

Fig. 3.



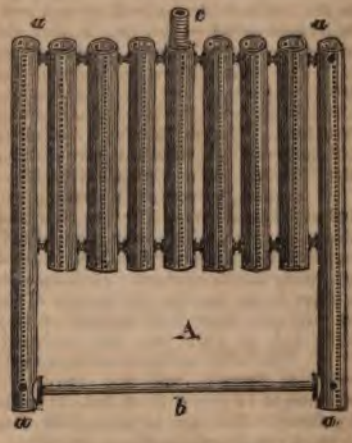
means of the pipes *d d*, and with the central tube of the central row, by means of the hollow projecting screw-piece *c* (figs. 2 and 5). This steam chamber is of wrought iron, seven-sixteenths of an inch thick, and the top and bottom are

Fig. 4.

secured together by strong screw-bolts *fff*, which pass through and through the chamber. The tubes, both vertical and horizontal, are of course kept constantly filled with water, and all the steam formed by them finds its way into the reservoir C.

The water in the vertical pipes should always be on a level with the cock *m*, figs. 1 and 2, and there should be nothing but steam at the height of the cock *l*. It is only necessary, therefore, to turn these cocks in order to ascertain whether there is a sufficiency of water, and to regulate the injection accordingly. O, fig. 1, is the door of the furnace; D the

Fig. 5.



chimney; *n* a trap-door, through which fuel is supplied to the furnace; and *p p* the ash-box.

A safety-valve *h* is connected with a graduated spring *k*; by means of which the degree of pressure exerted by the steam may be at all times ascertained and regulated. The inventors state that they generally work with a pressure of only ten atmospheres, or 150 lbs., on the square inch, but that they have pushed the pressure to as high as 70 atmospheres, or 1,050 lbs., on the square inch, without its being attended with any worse consequence than a rent in the end of one of the cylinders, through which the steam escaped into the fire, and extinguished it.

The steam is conveyed to the pistons by a service pipe, placed at the back of the reservoir C, at an elevation corresponding with the letter *g*.

q q are two large cocks, by opening which, when the steam is in full action, the boiler can be cleaned out completely, as often as may be requisite. Once a week will be generally found sufficient.

We subjoin an extract of a letter from Col. Macerone on the subject of this boiler, and of the steam-carriages to which it has been applied :—

"Such is the boiler with which every trip and journey has been made, spoken of in the papers, &c., and which you say Mr. Ogle asserts to be his ! ! ! Ogle, in his specification, lays especial stress upon the fact, that the invention which he particularly and solely applied for, is *that a flue for the passage of the fire and heat does ascend through each of the vertical cylinders, &c. &c., so that the water within each of them is 'between two fires.'* The only difference between the boiler as represented in my specification, and that employed in the two carriages which I have built, is, that the steam receiver is placed horizontally instead of upright, which I have found the more convenient position. * * I have succeeded in making the cylinders without rivets, by lapping and welding. * * I adhere to the plan of hollow tubes full of water for fire-bars, as that plan entirely avoids clinkers. Between each pipe there is one bar, but the vicinity of the pipes prevents them from getting so very welding hot, as when bars only are used. * * The boiler on the carriage recently running at Brussels, and now arrived in Paris, weighs 19 cwt. with its dose of water (50 gallons). The iron is one-eighth of an inch thick ; that of the ends one-fourth."

THE DAVY LAMP AND MR. J. MURRAY.

Sir,—As the high value in which your widely circulating publication is deservedly held by all classes of its readers, gives great importance and authority not only to your own communications, but also to those of your correspondents, I am induced to notice a letter signed "J. Murray," which appeared in No. 593, of the 20th inst.

The commencement of Mr. Murray's letter is remarkable for its assumption ; and as it may fairly be taken as a test of the estimation in which its contents *ought to be held, I beg* to replace it verbatim before your readers :—"I am reluctantly compelled, from want of leisure, to embrace a cursory survey of several topics in this letter, and dismiss them for ever." These topics, which Mr. Murray so unceremoniously intends, on a cursory survey, to dismiss for ever, are matters of no less importance to the community, than—the production of heat —a preventive for the dry rot—some of the peculiar properties of flame — and the extent to which reliance may be placed on the Davy lamp in coal-mines, in the presence of the inflammable gas called fire-damp.

That want of time, and, probably, also want of opportunity, have prevented this gentleman obtaining a full knowledge on subjects where long study and extensive experiments are required, may be readily conceived. But surely this is no excuse for obtruding his "cursory surveys" on such subjects on the public, and deducing from them conclusions at variance with the matured investigations of other persons. Neither Mr. Perkins' improvements, nor Mr. Kyan's preventive, are matters of life and death ; and while one of so much more serious a nature as the safety lamp is before us, I shall not take up your valuable space by defending them ; nor shall I notice particularly Mr. Murray's assertion, that he has proved the non-transit of flame through an aperture three times larger than Sir H. Davy found necessary to prevent, as far as he succeeded, the passage of flame from his lamp. On a perfect knowledge of the limits to which the uses of the Davy lamp ought to be confined, the safety of thousands of individuals daily and hourly depends. Is it, then, to be tolerated that any one should, on the loose information collected from superintendents of collieries, promulgate "that the workmen frequently work under circumstances where the lamp continues red hot"—of course, leaving it to be inferred, that they may continue to do so in safety, when Dr. Turner states clearly and decidedly in these words, that "whenever this appearance is observed (even the previous one of the lamp filling with flame), the miner must instantly withdraw"? Mark, too, the unanswerable reason for this, given by Dr. Turner : As "the heat emitted during the combustion (of the gas in the interior of the

lamp) is so great, that the wire gauze, if exposed to it for a few minutes, would suffer oxidation and fall to pieces." Surely, after the late fatal accidents in coal-mines from explosions, and after this statement from Dr. Turner, and the one previously published by Mr. Pereira, both of which are founded on a series of experiments most carefully made, and in several instances strictly watched by scientific persons, to whom their results were quite unexpected, it will not be necessary to attach much importance to Mr. Murray's individual experiments, to which he has thus referred:—"I have had the safety lamp red hot more than once in the mine; and often exhibit it in my lectures sustained red hot for a length of time in an explosive atmosphere;" and further, "where the lamp is stationary, or the atmosphere quiescent, the danger proceeds entirely from the particles of coal-dust, and which being blown against the red hot cage are raised to incandescence and flame, and become the cause of explosion."

The only excuse, if one can be made, for Mr. Murray's incautious letter, is, perhaps, to be found in its commencement; but he should consider that these are serious matters, and ought not to rest on "cursory surveys;" for that a single error in the use of the Davy lamp might in a moment cause the destruction of hundreds of persons.

I remain, Sir,
Your obedient servant,
U. G. R.

London, Dec. 29, 1834.

"THE ROYAL PATENT SEA-WATER PURIFYING COMPANY"—HUMBUG!

Sir,—I now address you in your character of a vindicator of the rights of inventors. In that character you have ever been found both able and willing to protect the inventions of the pennyless mechanic, and indeed of every other individual, from the encroachments or piracies of monied and powerful appropriators. The pages of the Mechanics' Magazine have always been open for the exposure of trickery, for the detection of falsehood, and for the correction of error.

The case to which I have now to call *your attention is this:—In the* year 1829, I invented and introduced, on board a merchant vessel then in the Mediterranean, an apparatus for freshening and purifying sea water. The vessel's cookhouse was fitted up with Fraser's patent cooking stove, and this I adapted to my invention—finding that it would generate steam with sufficient rapidity to produce fresh water for the ship's consumption, when required. I forwarded a description of this apparatus to your Magazine in the year 1833, and it was inserted in No. 501. Several important improvements have been made since that time, particularly in employing means to remove the insipidity of taste which has been complained of, by replacing the carbon which is displaced in the course of boiling and evaporation.

After I had left the merchant vessel above referred to, I submitted my invention to Mr. John Fraser, of Houndsditch, son of the inventor of the patent ship's stove, when I found that his father had constructed an apparatus nearly similar to mine, some years before, which had failed to meet with the success it deserved. Although, therefore, I assert the *originality* of my invention, I willingly yield to Mr. Fraser the palm of *priority*.

Matters were in this state, when Mr. Fraser was waited upon by a gentleman of the name of Wells, and questioned about the practicability of making salt water fresh. Mr. Fraser readily acquainted him (though in general terms) with our plans for the purpose, when he professed to be greatly pleased with them, and wondered much that they had not come into general use. This first visit was followed by several others from the same individual, under pretence of obtaining explanations, offering suggestions, &c., until at length having, as he no doubt supposed, squeezed the orange dry, he left off calling.

Judge, then, of Mr. Fraser's surprise and mine, when we saw lately announced in the papers, a "Royal Patent Purifying Sea Water Company," with a proposed capital of 120,000*l.*, and the name of this very Mr. Wells as "Managing Director"! The company is stated to be formed for the manufacture and *exclusive sale* of machines for converting sea or other impure water into fresh water; the "machines" thus offered

for public use being, after a certain form of construction, I suppose "invented" and "patented" by the said "Managing Director." Now, having had an opportunity of inspecting one of this "Royal Patent Company's" machines, I have no hesitation in affirming, that it is nothing more than a copy of Mr. Fraser's previously patented apparatus—minus some important improvements which Mr. Fraser (very prudently, as now appears) kept from the knowledge of Mr. Wells.

Passing over, however, the question of originality, I would ask where is the necessity of a joint-stock capital of 120,000*l.*, with a huge apparatus of directors, standing counsel, auditors, &c., to set on foot a manufacture of machines of so ordinary and inexpensive a description as those in question? Is it imagined that there will suddenly be such an extensive demand for the thing, that at least a thousand forges must be set at work to supply it? Or is it intended not only to supply machines, but the vessels also in which to employ them?

"The necessity of taking large quantities of water to sea" will, it is said, "be obviated, and a considerable additional tonnage afforded." This is true, but not to the extent represented. The allowance to each person, in a voyage to India, is not, as alleged, *a ton*, but *half* a ton: nor is it for water only that a ship calls at the Cape or St. Helena; there are other advantages in touching at those parts, into which it would be irrelevant however to enter here. The freight to the East Indies, moreover, is not 7*l.* per ton, as the Company's prospectus states; the very highest is now about 1*l.* 5*s.* These circumstances must, of course, lessen the advantage to be derived from taking a salt water freshening apparatus to sea; no matter whose apparatus may be used—the Company's, or Mr. Fraser's, or mine.

Much stress is also laid on the *advantage* of "salt for the ship's company being obtained." Allow me to say that this is all "fudge." Salt is a thing of which they obtain too much in the ordinary process of cooking on board ship. The promoters of the "Company" must never have been at sea in their lives, or they would have known that the *cook's constant torment* is the quantity of salt which is always depositing at the bottom of the boiler.

I am sure that the gentlemen whose names appear in the prospectus as auditors, bankers, standing counsel, and solicitors, would not have given countenance to such an imposition (for I can give it no milder term), had they known the real state of the case. For the sake of their reputation, therefore, as well as the safety of the public, I request your insertion of this statement of facts. I hope I have satisfactorily proved Mr. Fraser's originality, and *my* priority, as regards the "Company's" pretended patent. The means which we intend to adopt to obtain our rights is this: The "Company" having given publicity to the invention generally, and shown the possibility and utility of the thing, Mr. Fraser and myself will do our best to prove the superiority of *our* apparatus, and thus make the "Company" a channel for its introduction. I consider this only to be a fair mode of retaliation, and as one means of deriving good from evil. I am, Sir,

Your most obedient servant,

E. W. BAKER.

Old Broad-street, City.

[The practicability of converting salt water into fresh on board of ships at sea, is a fact of much older date than either Mr. Fraser, Mr. Baker, or any of the parties concerned in the joint-stock job, exposed in this letter, are probably aware of. Olympiodorus, in his Commentary on Aristotle, as translated by Taylor, says—"That sea water of itself, when unmingled with a fuliginous exhalation, is sweet, is evident from this, that sailors, when they labour under a scarcity of fresh water at sea, boil the sea water, and suspend large sponges from the mouth of a brazen vessel, in order that they may receive what is evaporated; and afterwards drawing off from the sponge what is evaporated, they find it to be sweet water, not partaking of the fuliginous exhalations." Many plans have been proposed, in more modern times, for freshening salt water—long anterior to those of Mr. Fraser and Mr. Wells—but the best of them can boast of little more efficiency than belongs to the simple process here described as having been in common use among the Greek sailors, centuries ago. Indeed, the process is one of so simple and ordinary a kind, that we cannot imagine how there can be any modification of it worth patenting, or if patented, which would bear investigation.—ED. M.M.]

ON STATIONARY FIRE-ENGINES.

Sir,—As your valuable correspondent, Mr. Thomas Deakin (p. 201), requests my opinion of stationary engines for the suppression of fires, I beg to submit the following remarks.

The late Mr. William Russell was a

strenuous advocate for the introduction of stationary engines, and he erected several fire-pumps in London and elsewhere; the idea of such engines did not, however, originate with Mr. Russell, as they were occasionally employed long before his time. Mr. Russell erected one of his fire-pumps at Aldgate, and another in front of his own house in St. John-street; but neither have been used at more than two or three fires, during the ten years they have been erected. There is a stationary fire-engine in front of St. Peter's, Cornhill, placed there long before Mr. Russell was born, that has been so long unused, that very few, if any, of the persons residing on the spot are aware of the existence of such a machine. At the place mentioned, there are two iron pyramidal cases, one containing a fire-cock, the other a fire-engine, which has not worked on a fire within the extent of my memory.

Although the occasions for using these machines have been so few, the moveable engines on the same stations have found frequent employment, and but for their assistance much property would have perished.

Stationary fire-engines are admirably adapted for the protection of theatres, manufactories, and buildings of that character, as they can be brought to bear upon a fire with great rapidity, and there is a certainty of obtaining water; for all such engines should work from a good well. A fire-pump also comes very much cheaper than a moveable engine of like power.

Under such management as would be necessary to render a fire-pump efficient, one good engine properly appointed would, in most parishes, render, with equal promptitude, much more effectual assistance than a hundred fire-pumps.

For the protection of *single buildings*, the fire-pump is the cheapest; but for the protection of towns or cities, moveable engines are by far the least expense, and under no system could they be entirely dispensed with.

A fixed engine of moderate power, is an excellent means of stopping the spread of fires in their earliest stage; but we who inhabit towns know, unfortunately, that fires frequently obtain so great a head before they are discovered, as *to require the con*centrated efforts of many powerful engines to arrest their progress.

There is great room for improvement in the supply of water, and also in the mode of serving it to the engines, and the water-companies would do well to give a little more attention to this matter; but as regards stationary engines, for general purposes, my opinion is, that they are as unsuitable as they are unnecessary.

I remain, Sir,

Yours respectfully,

WM. BADDELEY.

London, Dec. 31, 1834.

RAILROAD ACROSS THE ISTHMUS OF PANAMA.

We subjoin two decrees of the Government of New Granada, which may be considered as an advertisement for proposals to construct a railroad across the Isthmus of Panama; and as the subject is one of the greatest importance to the world in general, we shall offer a few observations upon it.

Ever since the discovery of the Pacific Ocean, some safer and easier channel of communication between it and the Atlantic has been the object of universal desire; and the narrowness of the tract of land which separates them at one point, gave great encouragement to the hope that such wish would be speedily fulfilled. Three centuries have, however, passed, and not only has no ship-canal between the two seas been made or even attempted, but there is actually nothing which deserves the name of a road, connecting any point on the one, with any point on the other. Seldom, if ever, has a wheel-carriage rolled from the Atlantic to the Pacific.

The Spanish Government did indeed order surveys, which were in one or two instances begun: and a host of decrees are still to be found in the old Recopilaciones, setting forth the importance of establishing a communication between the two oceans, the wealth it would produce, the power it would give to the Spanish crown, &c.; but the only work actually executed for the purpose, was by the voluntary exertions of a country curate and his parishioners, in the west of New Granada; they dug a canal through the valley of la Raspadura, by which, in the rainy seasons, a boat might pass from the head-waters of the Atrato, a long and shallow river emptying into the Atlantic, to those of the San Juan, a stream of similar

character, falling into the Pacific. The work, however, proved of no utility.

Since the overthrow of the Spanish power in America, the governments of the new republics, lying between the two seas, have been much occupied with the subject, though, it must be confessed, that they have done little more than issue vague decrees. The decrees now published are, however, more precise, being found upon minute information as to existing circumstances.

Humboldt, in his great work on Mexico, enumerates nine points or situations in which the waters of the two oceans are very near each other; and in three of them, he conceived, from the information in his possession, that a ship-canal might be made.

The first of these situations is in Mexico, between Guazecualao near Vera Cruz on the Gulf of Mexico, and Tehuantapec on the Pacific. The country has, however, been explored since Humboldt wrote, and it is now certain that a high chain of mountains intervenes, rendering all communication by water impracticable.

The second is in central America. The plan proposed is to improve the navigation of the river San Juan, by which vessels could ascend into the Lake of Nicaragua. The south-western extremity of that lake is only 30 miles from the Pacific, to which a canal might be made. The difficulties, judging from the partial surveys which have been made, are not greater than those which have been already surmounted in many other cases; still the expense of the undertaking would be enormous. The country is uninhabited, and labourers, as well as tools of every sort, would have to be brought from abroad; in addition to which, the deadly nature of the climate would render the sacrifice of human life incalculable. Companies have however been formed for undertaking this work, and engineers sent out to examine the ground have reported favourably. The government of Central America was in 1830 treating with that of the Netherlands on the subject, but the revolutions which occurred in both countries put an end to the negotiation.

The third in the Isthmus of Panama, which forms a part of New Granada, is the situation referred to in the decrees now before us. We can here form a better estimate of the difficulties to be overcome, and of the probability of success, as the country has been minutely examined with a view to this very object.—A survey was made in 1828-9 by an English engineer, Mr. Lloyd, and a Swedish officer, who were engaged for the purpose by Bolivar, and furnished with all the necessary instruments in the most perfect order. Their account of the operations is published in the Royal Society's Transactions for 1830, accompanied by maps and plans; and the utmost confidence is placed in its accuracy, by those who had the best means of forming a judgment.

The first question that occurs is as to the face of the country. Mr. Lloyd shows that "the spot where the continent of America is reduced to its narrowest limits, is also distinguished by a break for a few miles, of the great chain of mountains, which otherwise extends, with but few exceptions, to its extreme northern and southern limits;" and that "the principal difficulty in establishing a communication between the two oceans, either by canal or railroad, would arise, not from mountains, but from the number of rivulets to be crossed; which, though dry in summer, become considerable streams in the winter or rainy seasons. He states moreover the curious fact, that a great portion of the country traversed in crossing the isthmus, actually lies *below* the level of the Pacific.

Another great question determined by the two engineers, is that of the relative height of the two seas, or their difference of level, which difference had hitherto been supposed very great. The facts are as follows:—The time of high tide is nearly the same in both seas. The mean difference between high and low water in the Pacific at Panama, is about 21 feet; in the Atlantic, at Chagres, about a foot.—Finally, "in every 12 hours, commencing with the high tides, the level of the Pacific is first several feet higher than that of the Atlantic; it then becomes of the same height, and at low tide is several feet lower; they are then again equal, the Pacific afterwards becomes the higher, and so on."

The conclusions to be drawn from the accounts of the engineers are, that a railroad is certainly practicable; and the lines on which two could be made are traced on the map. Each road would begin on Chagres river, about 30 miles from its mouth, in the Atlantic; the one terminating at Panama, on the Pacific; the other and shorter, at Chorrera, from which a short canal would lead to the latter ocean. Neither road would probably exceed 80 miles in length. The river Chagres now admits no vessels drawing more than 12 feet, but it could easily be made to communicate with the safe and spacious bay of Limon, by which means large ships could discharge their cargoes at the commencement of the railroad. A canal for boats is also practicable, but a railroad would be preferable for several reasons.

As for a ship-canal, it is certainly impracticable at this spot. Supposing no difficulties to exist within the isthmus, the

ness of the Pacific, for some miles
ne coast, would forbid the entrance of
and it would clearly be of no value,
it could be passed by vessels which
navigate both oceans to advantage.
present state of the world, a railroad
s every advantage to New Granada,
the commercial world in general,
can reasonably be desired; and the
rtation of passengers and letters
would doubtless yield a large revenue,
larly if steam-boats were established
ne principal places on each sea, to the
ive extremities of the road.

*f the Legislature of New Granada, au-
ng the Executive to contract for the open-
a Carriage-Road across the Isthmus of
ma.*

enate and Chamber of Representatives of
ublic of New Granada, in Congress assem-
nsidering—
it the message from the Executive to
, of April 6th, 1833, does specially recom-
e propriety of having a road for carriages
across the Isthmus of Panama, from the
to the Pacific:
at the Chamber of the district of Panama
this important subject on the 16th of
31, and that nothing has yet been done to
wishes into effect:
it the province of Panama has again taken
sideration this same project, at its meeting
er 13th, 1833, on the petition of a citizen
hmus, who has proposed a means of open-
rriage-road, by which goods may easily be
ed from one sea to the other:

DO DECREE,

1. The Executive is authorised to re-
l propositions which may be made for
a carriage-road across the Isthmus of
; and also to sign a contract with any per-
ompany soliciting it, on the conditions
this decree.

The undertakers will have leave granted
open an ordinary carriage or railroad
e Isthmus of Panama, from the Atlantic
Pacific; and they may make use of any
rse which may assist in forming the
lation.

The road must be begun within two years
at after the privilege has been granted;
in which it is to be finished will be
d in the contract.

If the road should pass over private
e owners shall be obliged to sell them at
ice; that is, at what may be considered
ue by arbitrators, at the time when the
begun. If the land over which the road
be public (*baldia*), it will be given with-
iring indemnification.

The undertakers shall have the right to
rehouses or other edifices necessary for
into effect the objects of the enterprise,
ient places, provided they do not inter-
the laws relative to fortifications. For
poses, they may occupy as much land as
ecessary, no where, however, to exceed
uare varas (062 square yards), for which
lation is to be made as by Article 4th,
be paid, when the owners decline selling
erty.

The undertakers shall be allowed, as a
uneration, according to the species of
y may make, the enjoyment of the reve-
nue from it, for a period not less than 10 years, nor more than 50.

(1.) The right of demanding toll shall begin the moment the road is finished, and the *maximum* of such toll shall be that expressed in the tariff granted by the legislature of the province of Panama.

(2.) Should a railroad be made, leave may be granted to the undertakers to place steam-carriages on it; in which cases, it shall be settled in the contract what is the *maximum* price to be demanded for the transportation of persons or goods, from one sea to the other.

Art. 7. The undertakers shall have granted them, as a recompense, public lands in the Isthmus, for cultivation, to the extent of 20,000 fanegadas (about 100,000 acres), which they must begin to settle and cultivate within a year after they have received them; otherwise they will revert to the nation.

Art. 8. On the said 20,000 fanegadas of public land, foreigners may be established, who, for 20 years, shall be free from all taxes either on the land or its productions; nor shall they be required to do duty in the army, unless in case of foreign invasion.

Art. 9. Inhabitants of the Isthmus, or a company composed in part of such, will have the preference, under the same circumstances, in receiving the contract.

Art. 10. The Executive shall exact from the undertakers all the necessary securities for completing the work.

Art. 11. No contract which the Executive may make, can take effect without the approval of the Legislature.

Bogota, May 22, 1834.

[*Signed by the proper authorities.*]

Decree of the Executive for carrying the above Legislative Decree into effect.

I, Francisco de Paula Santander, President of the Republic of New Granada, in execution of the Legislative Decree of the 25th inst., authorising the Executive to receive proposals for opening a road in the Isthmus of Panama, from the Atlantic to the Pacific, and fixing certain points, according to which the contract is to be made and privileges granted to those who may undertake the said important work:

Considering that a period should be fixed for receiving proposals, after which the contract should be made with, and the privileges granted to, the person who offers the most advantageous conditions, and the best security for their performance,

DO DECREE,

Art. 1. Those persons, whether natives of New Granada, or foreigners, who, in virtue of the Legislative Decree of the 25th inst., may wish to undertake the construction of a road across the Isthmus of Panama, either for ordinary carriages, or a railroad, and to secure the privileges which are to be the remuneration for their laboured expense, will send their proposals, sealed, and under cover, to the Department of the Interior and Foreign Affairs, before the 15th of January, 1835.

Art. 2. Those who may send such psoposals, must appoint some one in this capital, with power and authority to sign the contract offered. The same person must be furnished with the means of proving that he who offers to undertake the work can carry it through, in case he receive the privilege.

Art. 3. In the envelope of each set of proposals shall be written the object of the paper enclosed, and the name or names of the persons desiring to undertake the work.

Art. 4. After the 15th of January, a day and hour shall be fixed for opening the said papers, at the Department of the Interior and Foreign Relations, in presence of the respective attorneys or agents, and the contract will be signed with the person offering the best conditions and the strongest security, which contract will be submitted for the approval of Congress at its ensuing session.

FRANCISCO DE PAULA SANTANDER,
President.

LINO DE POMBO,
Secretary of the Interior, &c.

Bogota, May 29, 1834.

STRENGTH OF CORDAGE.

The Boston Hemp Manufacturing Company have lately put up a machine, at their ropery on the Milldam, for the purpose of determining the strength of their cordage, spun in the common method by hand. A great number of experiments have been made by breaking ropes of various sizes and kinds on this machine, and the following exhibits the average result of these trials. The figures show the number of pounds required *by each inch of the square of the girt of the rope to part it*:—

	lbs.
Whale line spun by hand, best that could be produced	776
Whale line spun by machines	994
Russia bolt rope, first quality	723
Bolt rope of machine spun yarn	915
Running rigging, first quality, Russian	442
Running rigging, American, spun by hand	631
Running rigging of machine spun yarn	717
Cotton line	604
Coire rope	215
Rope made of Manilla hemp	610
Rope made of New Zealand flax, *phormium tenax*	722
Mean of all hand-spun hemp rope	633
Mean of all machine spun hemp rope	875

Showing the machine spun rope to be 36 per cent. stronger than the hand-spun. If, however, we reject the trials on Russia cordage, which is very weak, the superiority of the machine spun ropes is reduced to 24 per cent. over all others.

In no instance whatever, was the trial on machine spun ropes made on selected specimens, but the pieces to be tested were taken from common coils as made for use. Indeed, it happened that the machine spun ropes, except the whale lines, were made of hemp inferior in quality to that usually wrought in the machines. The modulus of cohesion of the strongest ropes in these experiments, is 30,700; or a rope of this strength could be let down into a pit 30,700 feet, or $\frac{1}{8}$ths of a mile, before it would be broken by its own weight. A rod of iron can sustain itself, according to Mr. G. Rennie, only for a length of 19,700 feet.

On the 27th of March, by the politeness of Mr. Treadwell, we witnessed the operations of the machinery for preparing the hemp and spinning the yarn; and we were also shown the method of impregnating the ropes with tar, which is done uniformly throughout their whole thicknes, the tar being kept at a temperature below the boiling point. The ropes made of these yarns have the appearance of being *stained* rather than *tarred*.

The superior strength of the ropes made from yarn spun by machinery appears to consist in this, that the fibres in the middle of the yarn are nearly of the same tension as those of the outside, whereas, in the yarn spun by hand, they are much more tense in the middle; and the short fibres being the first to give way, the whole stress is thrown upon the outside ones, which, being fewer in number, consequently cannot bear so much strain as a rope made up of fibres of equal tension.

The machine for trying the strength of ropes is so constructed as to try them fairly and accurately. The following experiments on the strength of three ropes were tried in our presence, and we have no doubt of their correctness.

No. 1. Whale line spun by hand—girt 2 inches; broke by 2,240 pounds.

No. 2. Whale line made by Boston Hemp Company, spun by machinery—girt 1$\frac{1}{4}$th inch; broke by 3,520 pounds.

No. 3. Running rigging made by the Boston Hemp Company — girt 2$\frac{1}{4}$th inches; broke by 3,440 pounds.

As No. 2 was one-seventh smaller than No. 1, we should add 502 pounds to the weight it actually bore, making 4,022 pounds, for the weight it would have borne, if it had been of the same size as No. 1: consequently, it was 64 per cent. stronger than No. 1. Again, No. 3 was one-ninth larger than No. 1; we must therefore deduct from the weight it actually bore 382 pounds, leaving 3,058 as the weight it would have borne, had it been as small as No. 1. It was therefore 25 per cent. stronger than No. 1.—*The Mechanic*—(*American Journal*).

PADDLE-WHEELS—A NEW SUGGESTION.

Sir,—Although the schemes of Lord Dundonald and others have failed, who had in view the construction of a substitute for paddle-wheels for propelling vessels, the latter being dangerous, unsightly, and inconvenient, I yet think there may be perfectly efficient plans for the purpose without them.

For the consideration of practical men, I beg leave to state a plan, that certainly appears available for the purpose. I

work, by a steam-engine, four or ropellers, according to the size of sel. The propellers should be f two or four pieces of oak, three thick, forming together a square nd so united on the *under* side, propelling it may offer the force whole square; but, in returning, ps should, by the reverse force, nearly parallel with the piston, g free egress to the water. The rs should work in pairs, by means rods or pistons (passing out at m through stuffing boxes) being ed to them; the rods to be moved, se, by cranks, with two propellers crank. The pistons or rods make four or five feet downward at about 18 or 20 degrees. Per- on propellers would be preferable ; and also the rods might be at- to the pistons of the cylinders, if t proper.

nk this machinery would be ade- to any requisite speed, with less than paddle-wheels; and the rs being below water-mark, the of the vessel would not prevent fective operation in the slightest

It is apparent that at every there would be powerful back e of 18 feet square surface against er.

I am, Sir,

Your obedient servant,

J. L. S.

, Nov. 26, 1834.

SHIFTING PADDLE-WHEELS.

—In No. 593 of the Mech. Mag., ive a paper, signed "Mashdoud lez," doubting my claim to the on of the shifting paddle-wheel, ed in No. 584.

I put one question to that gentle- Would a person be perfectly sane, efore the public an invention, as ing from himself—but procured manner suspected—and which he ave imagined had been seen long by some of the readers of a work e Mech. Mag.? I think he will in the negative. Consequently, o not wish to be enrolled in the of maniacs, I positively assure ntleman, that, so far from having *ich a work as he mentions, I en knew that it existed,* until I saw its title in his paper. That between the year 1824, when I was a subscriber to the Mech. Mag., and the beginning of the year 1834, when I again became one, I had never seen or perused one volume, or one number, of that publication—That the *first* idea of the propriety of such a paddle-wheel occurred about eight months ago—That *I have* seen a model of a wheel, contrived by a naval officer, to perform the same thing, but months after mine had been constructed; but as I do not feel myself at liberty to describe his plan, I can assure your correspondent the two are almost totally dissimilar.

Finally, in September, 1834, my plan was examined by several of the lords and gentlemen of the Admiralty; and, in compliance with an order from them, an inspection was held on it at Woolwich, before a number of naval, military, and civil officers, who all admired the *simplicity* and originality of my plan; and the report of Mr. Kingston, the inspector of steam-machinery at Woolwich, your correspondent may find in the Minutes of the Admiralty, by letter dated "9th of September, 1834," signed "John Kingston."

I must now, in thanking you for paying attention to my other communications, request you will give this as early insertion as possible.

I am, &c.

HENRY DUNCAN CUNNINGHAM.

Gosport, January 2, 1835.

THE RIGHT EMPLOYMENT OF WEALTH.

No. I.—*What is wealth?*

Sir,—The letter of "Junius Redivivus" on the Right Employment of Wealth, (xxii. 117) has led to the following remarks, which I have not had leisure to make sooner.

The answer to the question which heads this letter, namely, what is wealth? must not be—"*all* things physical and mental, which tend to the weal, health, or welfare of the holder of the wealth:" for this answer "is the representative of certain crude notions which pervade a large class of well-meaning people, and it is therefore a fitting subject for analysis, in order to explode it if unsound, or to work it out if sound; for when a man like 'Junius' gives his sanction

to an opinion, it carries weight with it, and, when of importance, must do either much good or much harm." The answer must be—"Such objects of desire, either animate or inanimate, as are produced or procured by labour."

Things physical and mental, which tend to the weal, health, &c., of individuals, are not *all* wealth, neither are they at all times or in all places wealth; but only those things on which the skill or labour of man has been exercised, and such things on which no labour has been bestowed, as are situated in certain localities, where labour is saved by their being exactly in such situations.

There are many things in nature which contribute to our weal and health, which are not nevertheless objects of wealth. Moral and intellectual pleasures from which happiness is derived, and the fountain of health from which the streams of pleasure must be supplied, are sources which are not at all directly comprehended in the meaning of the word wealth; but there are even physical sources and means which not only affect the senses in an agreeable manner, and thereby contribute to the health and weal of individuals, and consequently happiness, but which are even necessary to existence; and yet these means, say for example, light, air, heat, &c., are not objects of wealth.

There are other sources and objects which produce happiness, but which, in certain states of existence, are not wealth, while the same things in other cases are wealth; and yet in both instances they may give pleasure to individuals. Let us take the spontaneous productions of the animal and vegetable kingdoms, at the commencement of society in an infant colony, and we find them only mere objects of desire until constituted wealth by the hand of labour.

In uncivilized society, the mere waste lands which are accessible to all, and produce fruit suitable for sustentation; but fruit, on which, nevertheless, no labour has been bestowed—and the cattle on a thousand hills which own no law of art—are not objects of wealth; but the mere labour of appropriating them, would render them so.

The valuable minerals hidden in the bowels of the earth—even though the *possessor of the* surface which covers *them is* aware of their existence, and derives pleasure from a knowledge of their locality—are not wealth, until dug from their subterranean recesses by the powerful arm of labour.

It is not essentially necessary, that any commodity should be valuable in exchange to constitute it wealth; for if human labour has produced it, it is wealth, although none other than the producer of it, or the holder of it, may desire to possess it. Hence, things which may not have the least marketable value are wealth; while other things which would be valuable in exchange are not wealth, until labour is exercised on them.

Neither is it necessary that the labour, which is essential to constitute things wealth, should be wise, useful, or laudable labour. The brutal force necessary to press and tear away husbands and fathers from the bosoms of their families, during the wars (merely to increase power to crush the liberty of Europe, and to secure aristocratic tyranny in the full enjoyment of its power), rendered these poor men wealth to the British Navy; and the possession by force of human flesh by the African slave-owners, made this human flesh wealth, from the labour and force necessary to its subjection, and to retain it in slavery.

Many things which in one country are from the nature of the climate desired, have labour bestowed on them, and are hence converted into wealth; while the same sort of things in other countries, in their natural state, cause suffering to the inhabitants, and therefore are not, of course, desired; no labour being bestowed on them, they are not wealth, although they may exist in great abundance. Thus, for example, ice is to confectioners in this country a source of wealth; but no one would consider it so in icy regions, where it is destructive to the existence of both the animal and vegetable kingdoms.

In conclusion, nature *alone* furnishes us with nothing that we can call wealth; for however useful a thing may be when appropriated, or however much pleasure it may give from its beauty, its smell, or might give from its taste, yet, until identified with labour, it is a mere object of desire. Circumstances lead to a desire to possess, appropriate, or to produce from, objects which are the gift of nature; and this desire to possess, &c., leads to an exercise of labour on them,

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ed are—
, Many things which contribute
weal, &c., are not wealth.
ıd, Whatever advantages we may
from things existing in nature,
s not wealth until labour is exer-
ı them.
l, Things must first be desired
labour (which constitutes them
is exercised on them.
ld the foregoing remarks prove
: to the pages of the Mech. Mag.,
at my leisure go on with the other
immediately connected with this
ınt subject; and, perhaps, "Ju-
or other some of your intelli-
›rrespondents who may wish to
ı or disapprove of the above, will
their remarks until the subject is
led. I remain, Sir,

Yours very respectfully,

R.

'ater, Jan. 5, 1835.

'NDULATING RAILWAY—MR. BAD-NALL IN EXPLANATION.

r Sir,—Your readers might natu-
xpect that I should have taken a
:arlier opportunity, either of pub-
the particulars of those experi-
to which I so urgently invited
ttention some time ago, or that I
have given some satisfactory ex-
ion of my motive for withholding
I am not, however, without a
hat this letter will prove a suffi-
indication of my conduct against
iarge of neglect or wilful delay.
my letter of the 25th August last
382), I stated that the Whiston
h Railway was completed, but that
xperiments were unavoidably de-
by the refusal of the Directors of
'erpool and Manchester Railway to
modate us by the loan of a suitable
otive engine. At the same time, I
ıted that, under such circumstances,
no other resource than to endeavour
ain an engine elsewhere, either on
ır hire.
ıh this view I made every necessary
y; but the only engine which I
hear of as being disengaged was
lanchester, which was built by
s. Galloway, Bowman and Glas-
and though capable of drag-
considerable load, she was, from
her particular construction, by no means adapted to the safe attainment of that velocity which could alone determine, *on the Whiston line*, the comparative superiority of an undulating or horizontal railway. I say *upon the Whiston line*, because the dip of the undulation was far greater than I should ever recommend in practice; which may be judged of from the fact, that a loaded waggon, descending from the colliery by gravity alone, attained, after traversing about 500 yards, a velocity of upwards of 30 miles per hour.

Perceiving, however, that I had little, if any other, chance of trying immediate experiments, I consulted my partner, Mr. R. Stephenson, sen., on the subject, who, from being well acquainted with the capabilities of the engine, strongly objected to her being employed for the purpose in question, it being his opinion that, although a very powerful engine, when in good repair, the Manchester could not be trusted at those velocities which, upon the Whiston undulation, it would be necessary to attain. Mr. Geo. Stephenson was also of a similar opinion.

Thus situated, I resolved on making a second application to the Directors of the Liverpool and Manchester Railway, offering, at the same time, a guarantee for payment of any damage which the engine might sustain, and explaining the difficulty in which I was placed, by having publicly announced the trial of my experiments; which announcement I was induced to make in consequence of a verbal communication which I previously had with Mr. Booth, and from which I had formed, it appears, erroneously, an opinion that, if a *guarantee were* given, there would be no longer an objection to the loan of an engine being granted me. To this second application I received the following reply:—

"Railway Office, Oct. 13, 1834.

"Dear Sir,—I submitted to the Board your renewed application for the loan of a locomotive engine, for your proposed experiments on the Whiston Branch Railway, and am required to inform you that the Directors regret they cannot comply with your request. They gave the matter due consideration previous to their former decision, and they do not see reason to alter the determination they then came to. I am, dear Sir,

"Yours most obediently,

"H. T. BOOTH."

"Richard Badnall, Esq."

Under these circumstances, and finding how impossible it was for me to obtain a suitable engine, and feeling how deeply I had committed myself in your pages, by a declaration that the period was arrived when the whole question should be determined without further delay, I was resolved to adopt the only means which were left me of even partially fulfilling my pledge to the public. On the 21st October, I therefore called on Messrs. Galloway and Co., and solicited the loan of the Manchester engine for a few experiments, under the promise that the maximum velocity attained should not exceed from 20 to 25 miles per hour. With a liberality for which I feel greatly indebted, Messrs. G. and Co. granted my request, merely requiring a guarantee that I would return it in as good condition as I received it. On examining the state of the engine, it was found that the pistons required repacking; but as we could not expect to come to any very decided result, (the velocity being limited) it was thought unnecessary to make any alteration for a first trial. On the 24th October, Mr. Robert Stephenson, sen., and Mr. Gill, accompanied me, therefore, to Whiston; and the Railway Directors having accommodated us with empty waggons, we proceeded, after loading them with coal, to the trial of such experiments as we deemed compatible with safety, and likely to produce some data, whereon an opinion, pro. or con. could be formed.

It is necessary that I should here state, that the Whiston branch line was completed by Mr. M'Kenzie, under contract. That gentleman had previously given me a section, and although, upon that section, the summit levels were, no doubt, accurately defined, no intermediate levels had been denoted either on the section, or by stakes, on the ground itself; our only course, therefore, was to start from such parts of the descending line from the colliery, as would present our attaining a dangerous velocity, and to ascertain how far the train would rise on the opposite ascent; marking the starting and resting points, until future levels could be taken. Had the inclinations been regular, this precaution would have been unnecessary, as the measurement of the distances would, in such *case, have determined* the elevations. But *the Whiston line* forming one extensive undulation, varying according to the surface of the land, no criterion could be formed from such calculation.

An accident, which some time ago occurred to the Manchester engine, which left the rails, when descending the Sutton inclined plane, had unfortunately given her the character of an unsafe engine at high velocities; and it was evident that, on the present occasion, both the engineer and fireman were afraid of her. We, however, made eight experiments; Mr. Stephenson, myself, or Mr. Gill, accompanying the engine-man on each occasion. Our load was 80 tons; which, considering the condition of the engine, was an ample one, as she was proved to be only capable of drawing on that day about 15 tons up an inclination of 1 in 84, her steam being at, from 40 to 50lbs. on the inch pressure, though partially escaping between the piston and cylinder.

By these experiments, we were enabled to prove one very satisfactory circumstance—which was, that, notwithstanding the many disadvantages under which we laboured, the train invariably rose to a higher summit than that from which she had previously started. For instance, in the first experiment, the train started from a given point, which was carefully denoted, and rose to a higher point on the opposite ascent, which was also denoted; the total distance being 760 yards —time, 2′ 35″. The power then being reversed, the train rose 34 yards higher than it had originally started from: again being reversed, the train rose 64 yards higher than on the first experiment; total distance 862¼ yards, time 2′ 26″. The power being again reversed, the train rose 38 yards high than before; total distance 900 yards: when again reversed, the train rose 171 yards higher than before; total distance 1071 yards, and on the next occasion the total distance was 1167 yards.

On the 7th trial, no accurate result could be deduced, as some of the brakes were on the waggon wheels.

On the 8th experiment, the steam was brought down to 10lbs upon the inch; and I have every reason to believe, that when I am enabled to transmit to you a precise statement of the level from which it started and at which it rested, it will be found that the 80 tons were conveyed at that low pressure, very nearly, if not quite, from summit to summit.

Your readers will, I fear, be disappointed, and by no means satisfied with the rude statement which I now feel it imperative upon me to publish; but until I have a better opportunity of deciding the full merits of the question, I can only put them in possession of facts as they really occurred—this I have done impartially. In justice to myself, however, and to the cause which I have conscientiously advocated, and still continue to advocate, I ask them, what could I have done more? or what, under existing circumstances, can I do? All men of science must, I am persuaded, sympathise in my regret, that experiments of such a nature should be delayed, when such delay could be so easily avoided; and with regard to any chance of a satisfactory conclusion being come to, by employing the Manchester engine, I need only refer to Messrs. Galloway and Co. themselves, who, I am sure, will bear testimony to her being in every point of view unsuitable to the purpose. She is, as before observed, an engine capable of drawing heavy loads at moderate velocities, but her many moving parts and general construction, render her altogether unfit for the trial in question. It was my wish to have sent with this letter a correct section of the Whiston branch, with the exact distances denoted thereon, which the train traversed at our recent experiments; but severe indisposition which has, since the end of October, with the exception of a few days, confined me to the house, has prevented my paying that attention to the subject which I should otherwise have done. Wishing, however, to have an impartial survey of the line made, I wrote to Mr. Hall, of Warrington, begging him to prepare the necessary sections, showing the various levels, &c.; but he has not yet been able to undertake it, owing to his time being entirely occupied in completing a survey of the Grand Junction line, to deposit for Parliament: when the section alluded to is completed, I will forward you a copy of it. As a proof of the unfitness of the Manchester engine, for the trial of experiments on the Whiston line, I need only remark, that over a great portion of each undulation, her power was not only ineffectual, but she was almost an incumbrance, owing to the loaded waggons attaining, *by gravity*, a greater *velocity than she could effectually* command in advance of them. This will easily be understood by those who consider the difference in the friction of a railway waggon, and a locomotive-engine of her description. It also shows, that upon deep undulations, such as the Whiston line (where we have a fall of more than 30 feet in 500 yards), none but engines capable of sustaining an excess of speed above that which is produced by gravity, can be employed with *full effect*. Such was my view when, in allusion to the Whiston line (see page 214, No. 516,) I said, "*the full effect of practical experiment must depend upon the momentum acquired by the combined forces of gravity and steam being safely and effectually maintained down the descending line of each undulation.*" For the same reason, also, I have before mentioned that, for general practical purposes, a dip of about 15 feet in a curve of 1,000 to 1,200 yards, would be the proportion I should most strongly recommend: though exceptions might, of course, be advantageously made, where the nature of the ground required it—especially in passing under or over cross-roads, canals, &c., or where the inclined planes would not be so deep or so extensive as to produce a dangerous velocity without the employment of the brakes—considering, as I do, that velocity on railways is always dangerous when the engine (her full power being employed) is not able to keep up a dragging influence on the succeeding carriages, or, if behind the train, a propelling influence on the carriages in advance.

So convinced did I feel that no further impediment would be thrown in the way of a full and impartial trial of the undulating railway theory at Whiston, that at the meeting of the British Association at Edinburgh, in Sept. last, I as publicly announced my intention of immediately bringing the question to issue, as I had previously done in your pages. I hope, therefore, I shall not be accused of any disrespect to your readers, to yourself, or to the public at large, for a breach of engagement which it has been entirely out of my power, for the present, to obviate. I am, Sir,

Yours most respectfully,

RICH. BADNALL.

Farm-hill, near Douglas, Isle of Man,
Dec. 31, 1834.

NOTES AND NOTICES.

The New Parliament bids fair to be of a less scientific character than even the last, if we may judge from the fact that Mr. Babbage has not thought proper to contest the borough of Finsbury on the occasion.

Well-deserved Honours.—His Majesty has recently conferred a baronetcy on "Felix Booth, Esq., of Roydon Hall, in the county of Essex," avowedly for his public-spirited conduct in fitting out at his own expense the expedition to the Polar regions, under the command of Captain Ross. Sir Felix Booth served the office of sheriff of London a few years ago; but on that occasion escaped the honour of knighthood, so often inflicted on the holders of that dignity, on some such important occasion as the bringing up of a loyal address. It is believed that the present is the very first instance of a civic baronetcy having been bestowed for services in the cause of science. Captain Ross has also been knighted, and received permission to wear the insignia of his numerous foreign orders in England.

City Improvements.—The grand new street from the Mansion-house to London-bridge is proceeding towards completion with great rapidity, and is already a first-rate thoroughfare for foot-passengers. Princes-street has for some time presented the appearance of a brick-and-mortar desert in the heart of London, and a beginning has been made (by pulling down some houses at London-wall), in the continuation of the line to the bottom of the City-road. The note of preparation is also heard at the end of Cheapside, where the clump of houses between St. Martin's-le-Grand and St. Paul's church-yard are to come down, in order to effect the very desirable object of affording a more open view of our magnificent cathedral than can now be any where obtained. The enlargement of Smithfield is another improvement, which is to be set about immediately, in order to destroy the argument for the necessity of the New Market at Islington. The Common Council have determined on enlarging the north side—that toward Smithfield-bars, St. John-street, &c.—in opposition to some of the members of their body, who strongly advocated the demolition of the "rookery" between King-street and West-street, *alias* Cow-lane and Chick-lane. The new addition will certainly add nothing to the regularity of the area of Smithfield, which would evidently be most improved by taking down the Hosier-lane side, and bringing that into a line with the present extreme west-end of the market.

Exportation of Ice to India.—Lord William Bentinck has presented Mr. Rogers, supercargo of the ship Tuscany, with a handsome silver vase, bearing the following inscription:—"Presented by Lord William Bentinck, governor-general and commander-in-chief of India, to Mr. Rogers, of Boston, in acknowledgment of the spirit and enterprise which projected and successfully executed the first attempt to import a cargo of American ice into Calcutta." The quantity of ice landed by the Tuscany was about 100 tons, and the selling price being 6¼ cents. per lb., it is calculated that the owners received 12,500 dollars upon an investment, which, including the cost of all the extra precautions for preserving the ice, did not exceed 500 dollars.

Steam Explosion.—On the night of Thursday, the 11th Dec., about eleven o'clock, a tremendous explosion was heard by the inhabitants of South Ferriby and Ferriby Sluice, Lincolnshire, occasioned *by the bursting of the* steam-boiler belonging to *Mr. Franklin's* corn-mill, situate at Ferriby Sluice, and about a mile from Ferriby. The upper part of the broken boiler was found in a field near the mill, at about a distance of 150 yards; the bottom being left on the fire-place. The engine was driving at 40lbs. to the square inch; the safety valve was set at 50lbs., and the boiler was said to be capable of carrying 70lbs.; there was more than sufficient water in the boiler. It was erected about three years ago, since which time it had been used as occasion required; when there was not sufficient wind to work the mill, it took the mill-works. A galloway in an adjoining stable was killed by the falling upon it of the materials of the building, but there was no loss of human life.—*Hull Advertiser.*

The Cap of Liberty.—The coins of the United States used to have on one side a figure of Liberty with a cap on; but in the last gold coinage issued from the Mint of the United States, the cap has been taken *off*, for the reason stated in the following letter from Mr. S. Moore, the director of the Mint, to the Secretary of the Treasury:—"It is wholly at variance with classic authority to place the Pileus or Liberty Cap on the head of the figure representing Liberty. When it is introduced in statuary, or on a medal, or on a coin, it is found borne by Liberty herself on a wand, or in her hand, or appears at her feet, and indicates her as the beneficent being through whose influence the blessings of freedom are conferred on others; and such a cap, placed on a freed man, we know, from the Roman annals, was the insignia of his freedom. Soon after my appointment to the Mint, I addressed to Mr. Jefferson an inquiry in regard to the authority on which the devices on our coins had been originally adopted, and particularly presented the question as regards the cap on the head of Liberty. His recollection, he informed me, did not reach the subject, and no notes had been preserved in regard to it; but he was direct and explicit as to the unfitness of placing the Cap of Liberty on the head of the figure—adding, *for we are not emancipated slaves.*"

J. K. will find, on reference to our Journal of the 6th Sept., 1834, No. 578, and of this day, reasons for our not availing ourselves of his obliging contributions. Not the less, however indebted, and shall be glad to hear from him again.

Communications received from R. W. D.—N. C.—M. H. Drage.—Mr. W. Morrison.—A Constant Reader and Purchaser.

The Supplement to Vol. XXI., with a Portrait on Steel, of the late Mr. Telford, is now ready, Price 6*d.*; also the Volume complete, in boards, Price 8*s.*

☞ The Editor of the Mechanics' Magazine has made such arrangements as enable him to offer, on unusually advantageous terms, to undertake the solicitation of Patents for New Inventions, the drawing and revising of Specifications, and generally every other branch of Patent business. Drawings of Machines executed with accuracy and dispatch.

6, Peterborough-court, Jan. 3, 1835.

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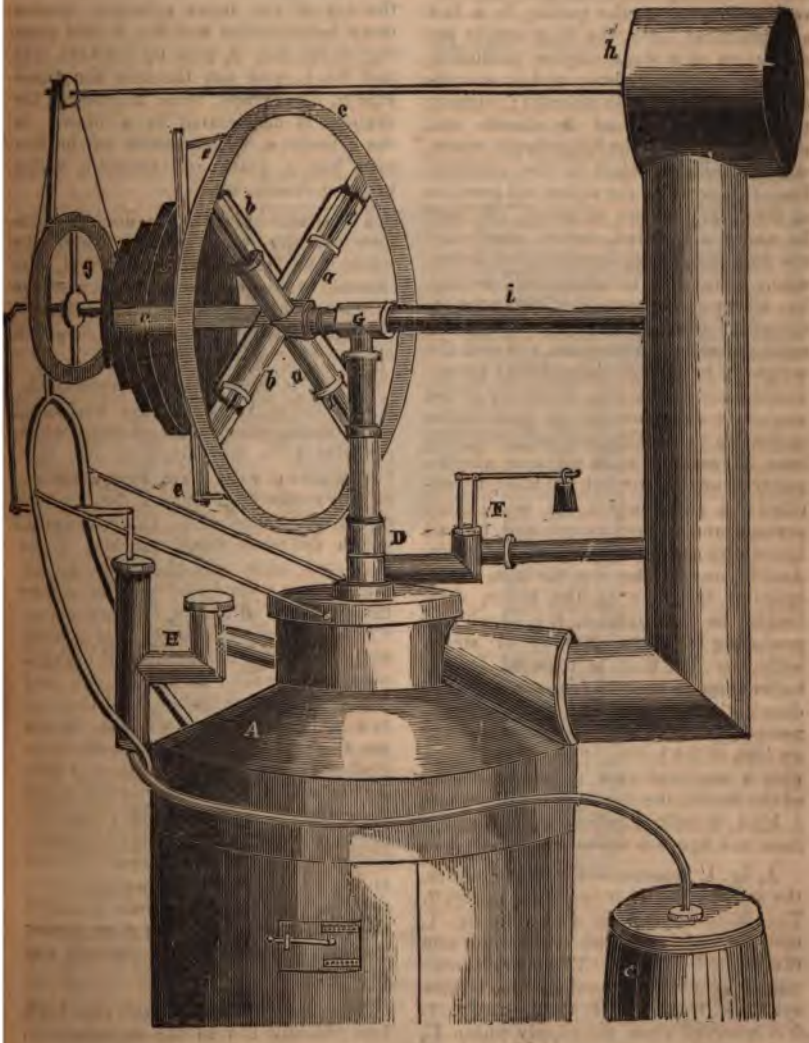
FAIRMAN'S ROTARY AND RECIPROCATING STEAM-ENGINE.

Fig. 1.



A COMPOUND RECIPROCATING ROTARY STEAM-ENGINE, AND AN IMPROVED BOILER, INVENTED BY SIMON FAIRMAN, OF LANSINGBURGH, NEW YORK.

(From the New York Mechanics' Magazine.)

This engine and boiler may be used separately, or the two together, as may be most convenient; the engine may be connected with any other boiler, and the boiler with any other engine. This invention presents to the public, in a fair and practical form, the long-sought *desideratum* of a steam-engine producing a rotary motion, without undue complication and liability to disorder; without the inconvenience of fly-wheels and cranks, and giving the full power of steam, without being subject to the constant loss of impetus by the action and reaction of the heavy masses of metal. It may be easily discovered, before examining the drawing, that this engine and boiler, when connected together, will occupy but a very small portion of the space required by the engines and boilers of the same power in common use, and that the weight of both engine and boiler are reduced; and as the cost, especially of the engine, is also reduced, at least in the proportion to its size and weight, it follows, of course, that, in all cases where a rotary power is wanted, it must be entitled to a preference equal to all those savings and conveniences, and for all locomotive purposes, still much greater. And it must be no less obvious, on inspecting the plan of the boiler, that, besides its compactness, it is capable of producing a given quantity of steam with less fuel than is required for the boilers now in use. As in the annexed drawing the engine and boiler are connected together; and as to communicate an idea of the boiler, it was necessary to give a sectional view, showing the form of the inside, the description will require a kind of mixed reference, alternately from one figure to the other.

A, fig. 1, represents the boiler entire, the inside of which is explained by fig. 2. The furnace door is shown in fig. 1, through which the fuel is inserted into the furnace *b*, fig. 2. The water is contained in three concentric double hollow cylinders, numbered 1, 2, 3, in fig. 1. It is received from the supply pump E, *fig. 1, into the outer* cylinder, No. 1, and passes thence through the bent tu into the inner cylinder, No. 3, forms the furnace, from which it through the tubes *c c*, fig. 2, i centre pan at the top *d*, which connected with the middle cy No. 2, from which inclosure and goes through the upright or ma ductor D, fig. 1, to the engine.

The fire goes from the furnace the top of the inner cylinder, down between that and No. 2, an ing under No. 2, goes up betwe and No. 1, and out through the pipe B, fig. 1; and, when necessa draught is accelerated by a blo the cylinder *n*. The bottom of t nace has a grate and ash-pan, need no description.

The spaces between the double ders and the centre pan, in whi water and steam are containe shaded in the sectional view; a furnace and spars between the cyl through which the fire passes, a white.

C, fig. 1, represents the water F the safety valve; G the hor pipe forming part of axis, through the steam is conducted to an the engine; *a a a a* are four cyl in all respects similar to those common reciprocating steam-e which cylinders stand at right with each other, with their bottom ing upon a cylindrical hub or c the cylinders, of course, forming a *b b*, &c., are the slide-rods, part of only are seen. The bottoms of th rods are attached to the flanges the tops of the cylinders, and the to a rim of cast iron *c*, which ri steadies and supports the tops of t linders by four straps, or parts of *d d d d*, which are bolted to the the cylinders. *e e e e* are four arm nected with said rim by studs of su length to leave room between sai and cylinders for the connecting revolve, and to which arms is at the main or driving pulley *f*, or, in thereof, a cog-wheel, as the cas require.

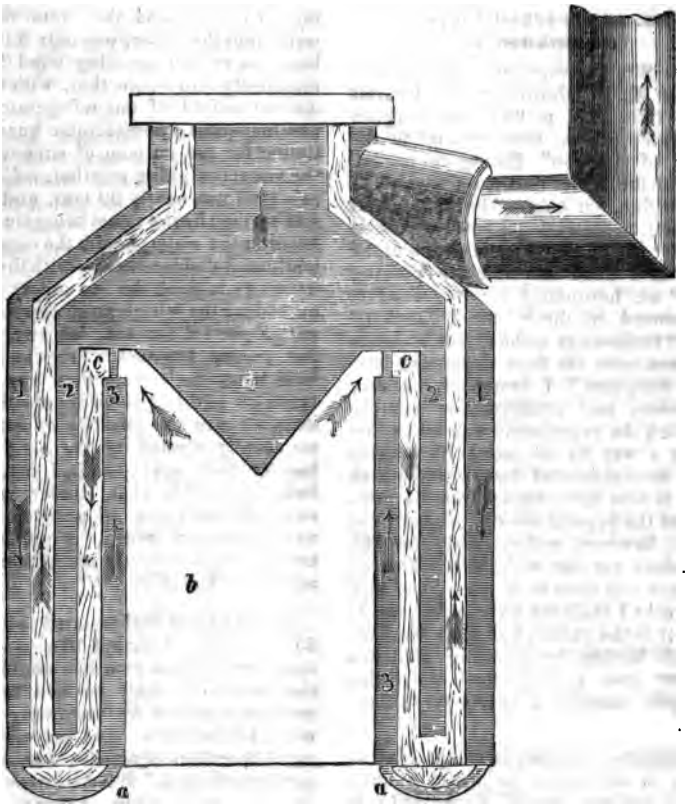
The connecting rods and cross being mostly hid in the represen are so nearly in the common form

need no description. But the feet of the said connecting rods are connected together by a moveable joint, so as to revolve round a centre pin, which is removed from the centre round which the cylinders revolve just half the length of the stroke of the pistons.

The steam is conducted through a hole lengthwise in the main axis G, and out through a hole in the side thereof into the bottom of each cylinder successively as they revolve.

On the side of each cylinder is a tube, passing from the bottom to the top, and also connected at the bottom with that which lets the steam into the bottom of the opposite cylinder, so that when the steam is let into the bottom of one cylinder, it enters the top of the one opposite; and as the feet of the connecting rods revolve round a centre at some distance from the main axis, as the pistons act and re-act, the cylinders must of course revolve *round the axis*; and when each *cylinder has passed round* to the opposite side from whence it is filled, the steam escapes through a hole in the opposite side of the axis, into a hole lengthwise of the axis, and parallel to the one through which it entered, and goes off through the discharge pipe i.

Fig. 2.



Mr. F. will engage to construct an

engine of fifty-horse power, of strong and permanent workmanship, which (both engine and boiler) shall stand on a circle of six feet diameter, and will not vary much in weight from three tons. And operating with a steady rotary impulse, and without any jar, its operation will be much pleasanter in steam-boats, and also prevent the injury done to the boats by the constant rocking motion of the engines now in use.

MR. HALL'S STEAM-ENGINE IMPROVEMENTS.

Dear Sir,—A copy of a letter from Captain K. B. Martin, to Mr. Charles Bessel (No. 586, p. 84), reporting on Mr. Hall's patent, now on trial in the "City of London" Ramsgate packet, refers to me rather unceremoniously. I think it due, not only to the public, but to myself, to state, that I never expressed myself "delighted with the action of the vessel in a head sea and an opposing wind," as, fortunately for me, I never experienced, in the "City of London," what "fresh-water sailors" would call a head sea;—so far from expressing myself "delighted," I lamented the very insufficient and unsatisfactory manner in which the experiment was made, being in a way by no means favourable to the development of those results which *ought to have been obtained* from the principle of the apparatus—the originality of which, however, unfortunately for Mr. Hall, does not rest with him. This he has been told more than once; and in a few weeks I shall not only endeavour to prove it to the public, but push the matter still farther, by obtaining what has not yet been accomplished upon this principle, namely, a *nearly perfect vacuum.*

I presume, of course, that Capt. Martin, when, in his report, he writes about a *perfect* vacuum, speaks *figuratively*, or at least *comparatively*. I can only speak to the facts as I saw them. On the first or second day of trial, even when the refrigeratory surfaces were all clean the mercury with difficulty reached 26½ inches. Subsequently, several times (as I was in *the habit of going* to Ramsgate on the *Saturday and returning* on the Monday), I had opportunities of knowing, *by seeing*, that the mercury did not reach 26 inches; at one time it reached only 25½ inches, and at another gradually declined to 25, and *even less.*

It appears to me rather strange that Capt. Martin, an intelligent officer as he is, should give it as his opinion that the "'City of London,' in fine weather and smooth water, was rather faster this year than last," when he must have known that any advantage derived, as to speed, from the principle of condensing by contact and then returning the water into the boiler, was only felt "in a head sea and an opposing wind." It is manifestly impossible that, with the *additional weight* of the refrigeratory apparatus—with a considerable quantity of timber for the purpose of strengthening the vessel (weighing together, as Capt. M. informed me, nearly 30 tons, and which was verified by the vessel being six inches lower in the water)—with the consequent additional displacement—with the power necessary to work the two supply pumps, to produce the refrigeratory current—and *with a partial vacuum, less perfect than last year by two inches* (a greater drawback upon the engine than any advantage that could be possibly gained by the *diminution* in the *quantity of water and air* usually ejected by the air-pump in the ordinary way);—it is, I say, manifestly impossible that, under so many new circumstances, all unfavourable to any increase of speed, a uniform increase of speed should nevertheless have actually taken place.

The saving of fuel is stated to be about 25 per cent. I should like to see this borne out by such proofs as would satisfy the public. I shall be told in reply, perhaps, that it is by "returning the hot water to the boiler, and preventing the usual operation of *blowing out*, that the saving is effected." But the loss by "blowing out" ought not to amount to $\frac{1}{15}$ part, or say, in round numbers, $\frac{1}{20} =$ to 5 per cent. How then is the remaining 20 per cent. obtained? Not surely by obviating the resistance to be overcome by the drag of the air-pump; nor by preventing the incrustation which ordinarily accumulates (from want of sufficient care) upon the surface of the flues, and

opposes the absorption of the heat by the water. I am confident no respectable engineer would risk his reputation by asserting any thing of the kind. The solution of the mystery rests, therefore, with Mr. Hall or Capt. Martin. Can it be, that the *pressure of the steam in the boiler* had any thing to do with the matter? Or perhaps the excentrics? I had not myself an opportunity of attending to these points, but Mr. Hall and Captain Martin, of course, know all about them; and of this I am sure, that, in all matters of science, particularly in the introduction of a *novel* principle, nothing should be left to *guess* at.

I much regret having intruded thus much on your valuable pages; but being aware, with many of your intelligent correspondents, that the columns of the Mechanics' Magazine are ever open to free discussion, and the exposure of unfair statements, I feel bound to notice that which I should not have done in this early stage of the business, had not my name been so improperly made use of to countenance the exaggerated statements, which Mr. Hall has put forth of the advantages obtained from *his* apparatus; when it is well known to Mr. Hall, as well as others, that I not only deny his claims to the discovery of the principle of that apparatus, but consider his manner of working it out, to be so bad, as to render nearly nugatory all the advantages that *might* be derived from it.

I remain, dear Sir,

Yours very truly,

JNO. BRAITHWAITE.

Bath-place, Nov. 28, 1834.

MATHEMATICAL SCIENCE — THE UNDULATING RAILWAY.

Sir,—Although I have not for some time past troubled you with any communications, I have never ceased to be a constant reader of your excellent Magazine. My attention has been more particularly directed to those papers relating to the physical and mathematical sciences. It was, accordingly, with feelings of regret I read Mr. Cheverton's article on the value and importance of mathematical science. It might have been read and relished in this country 300 years ago, but in the present enlightened age he cannot expect to make many converts to his system. Your able Swiss correspondent, Mr. Lewis Frend, has demolished most of his positions, and I have no doubt, if he is allowed to go on, he will extinguish all that remains. The truth is, Mr. C., in making his escape from a *Wallace*, has fallen into the hands of a *Tell*—that is, out of the frying pan into the fire.

I have read Mr. Whitehead's article on the undulating railway, and I have every reason to believe that he has managed all his equations with skill. Still I am afraid the results are not true, for this reason, that he has grounded his solution upon what I conceive to be a false principle, viz., that friction is the same at all velocities. Kinclaven (to whom, although late, I beg leave to return my best thanks, for his able solution of the problem I proposed on the *maxima* and *minima*,) in his solution, has founded his calculations upon the principle that friction is proportional to the times (is this not the fact?), and he very ingeniously has shown a method of separating the resistance of the air from that of friction, the truth of which might easily be brought to the test of experiment; but, upon the whole, I do not see that the result of Kinclaven's calculations are so very favourable for the undulating railway system as I first anticipated.

I am, Sir,

Yours very respectfully,

A LIEUT. OF ENGINEERS.

P. S.—I must again beg that some of your mathematical correspondents will do me the favour to explain why, in the differential calculus, it is asserted (proved, perhaps, but I do not understand it), that when y is a function of x, and w a function of y, that $d_x w = d_y w\, d_x y$; and again, when $w = x$ $\therefore$ $d_y x\, d_x y = 1$. —*See Millar's Differential Calculus*, p. 4, sec. v.

GORDON ON LOCOMOTION.

We mentioned, in a recent Number, the publication of a second edition of Mr. Gordon's book on Locomotion,* of which, on its first appearance, about three years ago, we expressed ourselves in favourable terms. We have since examined this second edition, and now propose to offer a few remarks upon it.

Mr. Gordon says—

"I have added so largely to some parts of my work, and made such changes in its arrangement—advisable at this more advanced period of locomotive science, for rendering it of more value and interest to practical and intelligent readers—that this edition may almost be considered *a new book*."—Preface.

So it truly may; it is quite "a new book," to which any thing that has been said in praise of the former can, therefore, have but small application. The chief merit of the work, in its original shape, was, that it presented a compendious view of all that had been done up to the date of its compilation, in the application of steam to locomotion on land—drawn principally from the Report of the Select Committee of the House of Commons on steam-carriages (1831), and the accompanying Minutes of Evidence—and reproduced, generally, in the very words of the authorities consulted. Of others there was much—of Mr. Gordon himself but little. But in this second edition, the compiler—or author rather, as he must now be called—has not thought it well, to be so modest. Deeming the part of second fiddle beneath his powers, he has installed himself leader of the band. We have now Mr. Gordon in every page—at every turn—it is his bow that flourishes the highest, his foot that stamps the loudest. But the performance—what shall we say of that? We should like to speak well of it, if we could; for we like not to speak less favourably than formerly, of one who has such strong hereditary claims to the good wishes of the mechanical world as Mr. Gordon, and who labours so hard (however unskilfully) to establish a reputation of his own. But the faults of the performance are of too prominent and offensive a cast to be passed over unnoticed, or noticed otherwise than with severity. Mr. Gordon has certainly, by his new way of going to work, produced "almost," if not quite, "a new book"—a much larger one too; but it is nearly by all that is new, just so much the worse. There is now a great deal *too much of Mr. Gordon* (as before there was *perhaps* too little); like many a fond but heavy-headed nurse, he has overlayed his foster-child; if it survive, it will be a miracle.

The grand object of Mr. Gordon's ambition, in appearing as a writer on the subject of steam locomotion, was, it now appears, less of a scientific than of a political nature.

"The great object for which we ventured before the public in a former edition—for which we were emboldened to appear at the lecture table, and to hazard the comforts of privacy in a public arena—has been, and will be, the extended application of steam to *economic* purposes, so as to counteract the evils attributed to its *physical* applications alone. For, although the use of the steam-engine has cheapened every other necessary of life, *it has not lessened the price of food.* Although it has reduced the value of the poor man's labour (his only exchangeable commodity), it has not produced the price of that for which he must labour. * * * We do not advocate any thing so preposterous as the change of the whole animate power of Great Britain at once, into inanimate, though in this the political economist can see the solution of all our Malthusian difficulties. What we urge is merely the partial adoption of the thing, to such an extent as will relax the present pressure, and restore us to a wholesome state of national prosperity. This will occasion no dangerous experiment, and will be gradually followed up by a progressive conversion, by which all the conflicting interests of society will be neutralised, and the aggregate wealth and prosperity and happiness of the empire be equalised."—pp. 13, 14.

We are elsewhere assured by Mr. Gordon, that we have but to substitute steam-carriages for the two millions of living horses in the country, to obtain "an increase of food equivalent to the consumption of *sixteen millions of mouths*;" that this will in a great measure "annihilate pauperism and redundancy

* A Treatise on Elemental Locomotion and Interior Communication; wherein are Explained and Illustrated the History, Practice, and Prospects of Steam-Carriages, and, the Comparative Value of Turnpike Roads, Railways, and Canals. Second Edition, Improved and Enlarged; with an Appendix, and a New Set of Plates. By Alex. Gordon, *Esq., Civil Engineer.* Tegg and Co. 1834.

pulation) altogether"—remove the not from the horses, but) from the of our oppressed brethren of the ld Isle, and make them "edu- industrious, happy, and prosper- —cause an "immense" saving in blic expenditure—render the repeal corn laws wholly superfluous— the payment of taxes "no longer a n"—even the national debt a thing ill "bear lightly" as a feather— passing on to the coachmakers' it" (oh, genius of bathos!) will set nasters and innkeepers free from ir present difficulties!

Gordon has evidently yet to learn ry first lines of political economy. ks with the confidence of an oracle things of which he is as ignorant child. To assert that the use of am-engine "has cheapened every necessary of life, but *has not less- e price of food*," is to assert, not a historical untruth, but an utter sibility. The price of food, as one knows, who knows any thing subject, must ever be the measure other values. To say that all the necessaries of life are cheap, is g more than saying that the food supports the labourers, by whom se other necessaries are produced, ip—but, putting the effect for the

You cannot possibly have dear nd cheap manufactures at the same they must both be cheap or both Still more absurd is the notion, ou have only to kill off so many is of horses to be able to feed so more millions of human beings. se all the horses in the country slain, how would that transfer the hey now consume to the garners poor? Would it put money in ckets of the hungry, or enable the to give his produce for nothing? men to be employed to do the now performed by horses, one understand how there would be of the former to support, and also ans of supporting them; but that the proposition—the scheme of ordon is to substitute steam-engines men. Now, these steam-engines have to be built, and they could e built with accumulated capi- et, assuredly, in the possession of *who are in want of food*. Well, *of this capital must be paid for,* and if not literally with measures of corn, yet with corn's worth. All the difference, thus far, would merely consist in the investment of so much capital in horseflesh instead of steam-engines. Then, as to the labour expended on the construction and working of these engines, there would, probably, be fewer hands required for these purposes than are now occupied in the rearing, keeping, and management of the horses they are intended to supersede—*certainly not more*. The total cost of the one sort of power—for capital and for labour—might be less than that of the other; but the difference, such as it might be, would constitute the only benefit that could result from the change—looking at it in a *victualling* point of view. There would be, most certainly, no such entire and clear gain of food, as Mr. Gordon weakly imagines. The reason of so many horses being employed in the country, is simply because they have been found to perform certain descriptions of labour better, or more economically, than men; and much as the assertion may startle Mr. Gordon, he may depend on its being a fact, as indisputable as his own incapacity for discussing such topics, that there would not have been so many men in the country *if there had not been so many horses*.

Mr. Gordon's argument for the destruction of horses is an argument for the destruction of steam-engines as well —of every sort of auxiliary power, in fact, that man can call to his aid. Destroy all the horses—destroy all the steam-engines—destroy all the machines that ever were invented for the abridgment of human toil, and then you will but follow out Mr. Gordon's doctrine to all its legitimate conclusions. There will then be neither dumb brute, nor dumber instrument of wood or metal, to feed—none but human mouths to fill; but then, as certainly, there will be both fewer human mouths to fill, and less to fill them with. Mr. Gordon's vision of national regeneration—not forgetting the "coachmaker's interest"—would be realised in a general march, or *roulage*, back to barbarism.

We have taken it for granted—for the argument sake—that there could be such an *entire* substitution, as Mr. Gordon supposes, of "inanimate for animate

power ;" but what likelihood is there of this? Is it supposed that steam-horses could ever be employed on the turf or in the chase? Or that the pleasure of steering a smoking kettle, mounted on wheels, could ever match the delight of bounding over hill and plain on the back of a spirited steed, or driving a curricle and pair through the mazes of the crowded park or promenade? Or that steam-carriages could ever be made so cheap as to be substituted with advantage for any of that numerous class of light vehicles, by which the retail traffic of the country is carried on—some drawn by two horses—some by one—some by things of skin-and-bone scarcely deserving the name? We may be quite certain, that in all those cases where horses are now used for pleasure merely, or where only one or two are kept for purposes of business, horses would, from choice or necessity, still continue to be used; and we shall probably not go far wide of the truth, if we reckon that these cases absorb nearly two-thirds of all the horses in the country. Mr. Gordon's panacea, therefore, could not, under the most favourable circumstances, have much more than a moiety of the virtue which he so confidently ascribes to it.

But much as Mr. Gordon expects from the substitution of steam-carriages for horses, it is on this condition always, that they shall only be employed on the common turnpike-roads, or on granite tramways, laid down on those roads. He protests, vehemently, against the introduction of iron railways to *facilitate* the motion of such carriages, as at once "commercially, agriculturally, and politically hurtful," (p. 232,) and repeats, in this second edition of his "Treatise," most of the nonsense, in the same vein, which appeared in his defunct "Journal of Elemental Locomotion," and was among the principal causes of its speedy demise. Having before more than once exposed the absurdity of this whim—of supposing that steam-carriages can be employed to the greatest advantage where there is the most friction—we shall here content ourselves with noticing some small matters-of-fact—or fiction, rather—which Mr. Gordon has brought forward in support of his views.

To prove that iron railways are inferior to granite tramways, he cites the example of the Liverpool and Manchester Railway. "How far that railway," he says, "favourably circumstanced as it is, has been profitable, *cannot* be gathered from the published accounts of the Company." But, nevertheless, "it can be shown, *beyond a doubt*, that its large dividends *must have been paid out of capital, or out of borrowed money*." He then proceeds with his attempt to show this "beyond a doubt,"—quoting constantly, as he goes along, the very accounts which he sets out with asserting nothing can be gathered from—but, instead of arriving at any such "beyond a doubt" conclusion, he ends with stating merely, that the facts adduced "*lead him to a belief* that the dividends are paid from borrowed money—that borrowed money is thrown into the capital account—and that, in fact, the dividends are thus paid out of capital." And what are the facts which lead him to this belief? In 1831 the gross receipts of this railway were 155,502*l*., and the gross disbursements 84,404*l*. For that year at least, then, there was a clear residue of 71,098*l*., and no occasion to pay the dividends out of capital, or to borrow money for the purpose. In 1832 the gross receipts were 155 808*l*., the gross disbursements 94,936*l*. The residue this year was not so great as in the year preceding—only 60,872*l*.—but still amply sufficient to allow a dividend of 9 per cent. to be paid out of it, without the least help from any other source. In 1833 the gross receipts were 183,385*l*., the gross disbursements 109,250*l*.; leaving a clear residue of 74,055*l*., and still less occasion than ever to draw on any other fund than the actual profits of the concern for a dividend. We give all these figures as they are given by Mr. Gordon himself; and if they do not prove ("beyond a doubt") Mr. Gordon to be a great booby, or, what is worse, a wilful calumniator, then is there no faith to be put in the simplest arithmetic. But these large balances every year notwithstanding, the directors have "raised considerable sums of money by way of loan." Yes, they have, and it is on this ground—a most shallow one, as we shall presently see—that the whole superstructure of Mr. Gordon's charge against the directors, of gulling their constituents and the public, rests. After the railway, as first planned, had been

completed, it was deemed expedient to construct a tunnel under the town of Liverpool, to connect the railway more directly with the docks; and the money required for this purpose, the Company were authorised, by Act of Parliament, to borrow at as cheap rates as they could procure it. Borrowed it accordingly has been on exceedingly low terms (such is deservedly the high credit of the Company), and the interest upon it has been regularly paid out of the income of the railway—*in addition to the dividends of 9 and 10 per cent. paid to the proprietors.* Now it is out of the money, thus borrowed, that Mr. Gordon insists the dividends "*must* have been paid." For, had the Company built the tunnel out of their profits, they would have had no profits left—so it is he reasons—and since they borrowed in order to be able to divide their profits, it follows that but for borrowing they could have had no dividends. All very true—singularly logical—but what then? Suppose there had been no borrowing, the tunnel must have been built *out of profits;* and what profits? The *profits of that very railway which Mr. Gordon asserts yields none.* It is manifest that, as far as regards the question at issue, namely, whether the Liverpool and Manchester Railway has been a profitable concern or not—it matters not how the clear residue may have been disposed of—*it is enough that there has been such a residue.* The tunnel under the town was not an indispensable appendage to the railway; the Company were not bound to execute it—neither to appropriate their profits, nor to borrow money for the purpose. They undertook it, because they saw that from their position they could undertake it on more favourable terms than any other body of individuals; and they borrowed the requisite capital from others, instead of advancing it out of their own pockets, because Companies, like individuals, act wisely when they can borrow money at 3 or 4 per cent. interest, to make 9 and 10 per cent. of it.

The calumny which we have been refuting (perhaps needlessly), is, after all, not one of Mr. Gordon's own—unless by adoption. He has but repeated the course of observation made use of respecting the Liverpool and Manchester Railway, *in a Book of Calumnies,* published some time ago by a person of the name of Cort, for the purpose of bringing all railways into disrepute—a work of some cleverness, but shamefully deficient in veracity and candour. Mr. Gordon was at one time accused of having written this book for Cort; but this he has publicly denied. Strange, however, though he has disclaimed somewhat indignantly the authorship of the work, he has not disdained to father a portion of the falsehood which it contains; equally strange, that he should be ashamed to acknowledge his authority, and yet retail the very slanders which are the things that make that authority discreditable to quote!

Mr. Gordon's conduct is the more reprehensible, that he could not be ignorant of the fact (for it is recorded in some of the documents which he quotes), that the Directors of the Liverpool and Manchester Railway, were, some time ago, at the pains to publish an official refutation of the charge brought against them by Cort. Although well aware of the existence of this refutation, Mr. Gordon never once alludes to it. He gives the charge, but suppresses the answer made to it! If it was in his power to show that the answer was insufficient, it was his duty to do so; and if he could have done so, who can doubt that he would? He stands, therefore, in the not very enviable predicament of having not only repeated a gross untruth, respecting a matter of great public interest and importance, but of repeating it, *with a perfect knowledge of its being so.*

Next to granite tramways, in Mr. Gordon's estimation, come *canals.* He prefers even canal transport at nine miles an hour (at the utmost) to railway transport at twenty! His case, it will be seen, is a hopeless one—an incurable *railway-phubia.*

"Too hasty assumption of facts, or rather calculations, made from a few imperfectly observed phenomena, have, in the case of canal navigation, led men of science into labyrinths of error; one of the consequences of which has been a detrimental depression of canal property on the one hand, and a wild and ruinous investment of capital in general railway communication on the other."—p. 233.

Mr. Gordon tells the gentlemen of the

canal interest, however, not to despair, for that certain persons have arisen in these later times, who have rescued the subject from the "labyrinths of error" in which "men of science" have involved it. And who does the reader think these persons are? Why, no other *(risum teneatis!)* than Mr. John Macneill, of water-skimming-notoriety, and Mr. Gordon himself!

"We would refer our readers to an *excellent* work, by Mr. Macneill, 'On the Resistance of Water to the Passage of Boats upon Canals and other Bodies of Water.' Mr. Macneill's experiments were conducted with that patient industry, and mathematical accuracy, for which he is so well qualified. Having myself assisted in all the experiments which he has published, I may be permitted to sum up his results as follows."—p. 248.

The summing up which follows we need not give, as our readers already know all about the idle experiments referred to.* Suffice it to say, that the ground on which Mr. Gordon claims for Mr. Macneill and himself the everlasting gratitude of the gentlemen of the canal interest, is their having effected their "relief or escape from the old law of the resistance (of water) being in the duplicate ratio of the velocity." He might as well have claimed their gratitude for enabling them to do without water at all. What he calls the "old law" is the law still; the experiments referred to have done nothing towards subverting it, and nothing ever can subvert it, for it is but a law of nature, and like all her laws, fixed and unalterable. The "excellent work" (by Mr. Macneill) to which Mr. Gordon refers his readers, and the experiments conducted with so much "patient industry and *mathematical accuracy*," (Mr. Macneill, mathematical!!!—what next?) and at which "myself" assisted, have but served to make Mr. Macneill and his panegyrist the laughing-stock of the whole scientific world of both hemispheres. We suspect that, if all were known, the laughing might settle into something like disgust. What if it should turn out that the work which Mr. Gordon recommends as so "excellent," was written by Mr. Gordon himself? He has not been slow to deny that he wrote the "*Book of Calumnies*" for Cort; will he be equally prompt in denying that he wrote the *Book of Nonsense* for Mr. Macneill? We can only say if he does, that rumour and Mr. Gordon must have a very queer account to settle with each other.

* *See Mech. Mag.*, vol. xx. p. 134.

AXLETREES AND AXLE-FRICTION—"BIRCH ROD" IN REPLY TO JUNIUS REDIVIVUS.

Sir,—There are a certain class of writers who, when they take up a subject to discuss, stick to it in the teeth of facts and of truth, and yet, perhaps, conscientiously. They consider themselves to possess such superior powers of discrimination, that they are betrayed into the feelings of those stiff-necked individuals who think that, "right or wrong, they shall not be contradicted." They forget that there is no humility in surrendering to truth; and although their talents make them skilful advocates, they ought to learn the lesson of candour, and that there is far more praise due to him who submits to truth, though powerful enough to oppose it, than to the man whose talents enable him to make the "wrong appear the better reason," and pertinaciously sticks to his former prejudices. If "Junius" should find any thing applicable to himself in these friendly hints, I shall be glad; and after he again peruses his last letter, I hope that he will forgive me for thinking, which I do conscientiously, that he belongs to this class of persons. When he says that he has no interest in Collinge's axle, I believe him more readily than I do that he is open to conviction. This want of faith in me arises from my never having known "Junius" to submit in any controversy, although stubborn facts, that could not be disputed, were frequently produced. Of the truth of this assertion, I leave the constant readers of the Mechanics' Magazine to judge.

It so happens that the schoolmaster having gone abroad, has not given advantage to one class alone, but in this case to the defensive as well as the offensive; and therefore there will, I think, be little difficulty in showing the inconsistent reasoning of some parts of his last letter.

ht answer some of his questions, e of his remarks, in a Scotch- manner, and say — Who are vouch for the French mecha- ng behind the English mecha- Who are the mechanics who double nuts not superfluous?— they who vouch that an axle- r breaks but at the shoulder?— the scientific men who doubt knight whom "Junius" refers ot the capacity of judging of cal excellence?—Where do the age coaches run to or from, Collinge supplies?—Who are vouch that "Junius" has no in Collinge's axle? But I shall m thus, because it would be to nfairly; yet, if "Junius" wishes tions to be believed, without a mes to confirm them, he must r the sake of consistency, to be ough to grant the same advan- others. But to his letter.

us" says that I consider it a strong tion that Mr. Birch's axles are ecause the Society of Industry, aris, has elected him a member. er it nothing of the kind, and I have said could have led him so; for I consider that still erfection is yet to be attained in making. The Society of Paris erely introduced, by the way, to t they held different opinions to ;" and the merit of the improve- as claimed for the cylindrical alone. But let "Junius" have benefit of his supposition.

inks it possible that the mem- the French Society may have mistake. This is no argument. sible, nay, probable, they have e a mistake. He says it is no the excellence of the axles that ety has considered them good. ly less proof of their inferiority, ber of minds go for any thing, considers them bad. But let us pro. and con. of the matter.

embers of the Society of Industry, tures*, &c., of Paris, are about 260 in number; and include some of the most eminent men of science and mechanicians in France. On the other side we have "Junius!" Then, in the name of wonder, who is "Junius," that his solitary opinion should outweigh the opinions of a whole society? Have we seen any proofs of his mechanical knowledge in the Mechanics' Magazine?—No! Have we seen any proofs of his mechanical knowledge in the Monthly Repository?—No! Have we seen any proofs of his mechanical knowledge in the Examiner?—No! Have we seen any proofs of his mechanical knowledge in the Producing Man's Companion?—Alas! "Junius," the echo of the last answer is just in time to reply to this question also with a—"No!" Where, then, shall we find proofs of the great mechanical knowledge that is to outweigh the opinions of so many individuals? Answer, "Junius," or the public will assuredly prefer the opinions of the learned men of Paris to yours.* 'Tis true that, in the works above noticed, we have many valuable papers on moral and economical science, but "Junius" does not deal in practical details; nor is there one subject on mechanical science, by him, treated practically in the works alluded to. In the Producing Man's Companion we are certainly told that he has been in the habit of using mechanical drawing instruments; and with this, yes, and this only! gentle reader, as a proof of "Junius's" mechanical knowledge, must we be satisfied, until he enlightens us with respect to where the other proofs are to be found.

The fact that Mr. Birch has fitted up seventeen carriages with his axle, certainly does not prove any thing of its excellence, but it proves that the proprietors of these carriages, who had an opportunity of seeing and trying other axles, considered differently to "Junius;" and, although it is true that "an axle might possess undeniable excellence, and opposing interests and circumstances

ssociation to which our correspondent evidently not that commonly known by of the "Society of Industry," but the re de l'Industrie, Agricole, Manufactu- ommerciale;" an institution of a much t date, having been founded by M. Cæ- , the well-known statistical writer, no k than 1830 or 1831.—Ed. M. M.

* Strange that such questions should be asked in the course of a controversy arising out of a paper which gave such unequivocal proofs of a thorough intimacy with mechanical subjects, as that of Junius on "Axles and Axle Friction." "Birch Rod" may possibly have the best of the argument, as regards Birch's particular axle—though that we are far from asserting—but he will assuredly do no good to his cause by questioning the mechanical capabilities of his antagonist.—Eds. M. M.

might keep it unknown for an indefinite period:" yet it is equally true, that all interests would oppose an invention which possessed no excellence, and bury it in oblivion.

"Junius" still thinks that the single nut cannot be screwed tight without jamming the wheel. I think differently, for the reasons before adduced, and because the end of the nut is coned. This is an opinion, however, and all who prefer the double nuts, of course, have a right to adopt them. He wishes to make it appear that the object aimed at by coning the end of the nut cannot be obtained, because, he thinks, the threads of the screws cannot be cut with sufficient accuracy and rapidity. He will find, however, if he will but give himself the trouble of witnessing the operation, that the threads *can* be cut with sufficient accuracy (aye, and despatch too) for all practical purposes; and, although he sneers at the idea of the cone diminishing friction, surely he cannot deny that less friction is occasioned by two bodies opposed to each other on the cup and ball principle, than by two flat surfaces coming in contact.

I now hasten to the cylindrical barrels, which, as I said before, is the whole that Mr. Birch claims as his invention. "Junius" dwells much on the extra diameter and weight of the nave. Let us see what it amounts to. The barrels are of wrought iron, 3-16ths of an inch thick, consequently the nave will be increased 3-8ths of an inch in diameter. I shall leave "Junius" to calculate the trifling extra weight and surface of this zone of 3-8ths of an inch in width; and having done so, can he conscientiously say that it will bear comparison with the great advantage of a double action to the wheel? I hope he will answer this question in a direct manner. If he still thinks the one will balance the other, then let me tell him further, that it is not necessary that the arm of Birch's axle should be of the same size as the arm of any other axle, because the barrels act as a stay to it, and give the arm nearly as much strength as if the whole were solid. Of the truth of this assertion "Junius" may satisfy himself by cutting or reducing a part of a circular stick or rod (but I think he had better try his hand on something *soft*, as he may possibly find a *birch rod too hard for him to cut*), that is one inch in diameter, to the half of an inch, then filling it in all round with a zone a quarter of an inch thick, when he will find the whole nearly as strong as if solid, because zones, or ends of the cylinder, butt against the shoulders of the stick. There can little difficulty arise with Mr. Birch's axle, in respect to the particles of silex or grit, because the grooves may be made either longitudinally in the arm, or transversely or longitudinally in the barrels; and even if one action is stopped, the other immediately goes to work; whereas in other axles, when the only action they have sticks fast, the wheel must, of course, stand still.

"Junius" appears never to have heard of an axle-arm breaking in the centre. What, "Junius," never—after having given so much attention to axletrees and axle-friction? Surely he remembers, when a schoolboy, of taking out his pocket-knife and making an incision all round the stick he wished to break. Is it not reasonable to think that an axle-arm is liable to break where a transverse incision is made in it, because the whole arm is then reduced to the strength of an arm of the diameter that the grooved arm is at the incision?

There is another great advantage attending Mr. Birch's invention, and that is, that the cylindrical barrels may be fitted to old axles, to suit those who wish to retain the old conical form of the arm. The insides of the barrels are made conical to suit the arm, and the outsides are made cylindrical to answer the form of the box. I need not dwell on this advantage, which will at once be acknowledged, perhaps, even by "Junius."

The distance which Mr. Birch's gig ran, could not possibly be accomplished by Collinge's axle, even with all the advantages that "Junius" names; and if the cap were taken off the latter, I think that I am near the mark, when I assert that the wheels would stick fast at less than 150 miles.

The wheels of Mr. Ramsbottom's cabriolet were four feet six inches in diameter, and tire half an inch.

True, "Junius," there is rubbish in the axletree market, and those who understand not the matter must pay the *price* of verification. There is a deal that might be said on this little sentence, but I shall at present content myself by remarking, that as there is certainly a

rubbish in the market, I shall
ur to use the birch rod, or rather
h broom, to sweep it out.
nius" assures me that he is in no
luenced by any proprietorship of
es in question. I, in my turn,
him, that "were Birch's axle
ed Collinge's, and Collinge's
ristened Birch's, my opinion
remain the same;" and although
ir of ever getting "Junius" to
"rod," for that is not his cus-
t he will have to endure, so long
mains refractory, the correcting
es of

A BIRCH ROD.

, Jan. 12, 1835.

PORTLAND BREAKWATER, AND MR. HARVEY.

I hope you will not think I am
g too much on your pages, in
ng a place for the enclosed let-
e writer is well-known at Wey-
as also no doubt to many of your
in other parts, for a gentleman
intelligence and respectability;
is an entire voluntary testimony
art.

I remain, Sir,
Yours respectfully,
J. HARVEY.

outh, Jan. 8, 1835.

dear Sir,—I observe in the Mech.
hat attempts are made to rob your
ber of the credit of originating the
l Breakwater. If it will be of any
e in your defence of his claim, I can
testimony, that in the year 1800 I
ly heard him speak of his plan, and
nute details of the same.
ring been so long separated from all
lates to Weymouth, you will not
recognise, in this communication,

"Your old friend,
"JOHN HAM."

ol, Jan. 2, 1835."

DETONATING POWDER.

—At p. 203, No. 593, of your very
le Journal, your correspondent,
., mentions the explosive force of
ting powder, and seems inclined
ik that its mixture with gunpow-
ght produce a stronger and more
article.

ve some apprehension that J. L. S.
much of a "gunner," otherwise
d scarcely have recommended it for "*general purposes.*" Any sportsman of the slightest experience, must have been struck with the effect which it produces on the *nipple* of a fowling-piece, which is rapidly injured by it, and requires after a short time to be replaced by a new one. The nipple of the gun which I have shot with this season, and which was nearly new at the commencement, is very much eaten away, and that notwithstanding I have taken particular care in keeping it free from visible rust. The percussion powder contained in the copper caps must, therefore, contain some agent, which acts very powerfully on the metal, and finally causes its destruction. Consequently, I am inclined to think (probably I may be wrong) that were detonating powder mixed with gunpowder, the gun charged with it would, in a very few seasons, be greatly injured, and ultimately quite spoiled. Moreover, the *danger* attending the use of the powder would be very great, inasmuch as a *very small quantity* of it would be sufficient for a charge; and if (as would, it is feared, very frequently be the case) *more* than the *exact* quantity were used, it would endanger the bursting of the gun. Possibly, for charging shells, and such like purposes, it might answer *well;* but for the purpose of fowling, &c., I consider that it would prove very dangerous.

Putting out the flame of a candle, by firing a percussion cap at it, is a very common amusement with gentlemen in some parts of the country, and many a jovial bottle has been cracked through the interposition of a "*percussion cap.*"

I am, dear Sir,
Very sincerely yours,
J. L.

Bulbourne, Jan. 3, 1835.

SIMPLE AND ECONOMICAL METHOD OF SMOKING HAMS.

Sir,—The following economical and expeditious method of smoking hams, &c., was lately communicated to me by a French gentleman, who has recently arrived in this country, and as I have never seen it practised in any part of England, although I have been in every county of it, the publication of it may prove useful:—Take an old cask (a sugar hogshead is best), and make it air-tight by clay or putty, leaving the top open; cut out a square hole near the bottom, just large

enough to enable you to introduce inside a small stove or pan, filled with lighted saw-dust, wood, or other burning material; hang the hams from a strong stick or pole fixed across the centre of the cask, near the top (a good sized one will with ease hold six large hams); then cover over the head of the cask with a cloth, not too coarse, nor too fine, but sufficiently open to enable the air to assist the operation of the fire, and prevent its being put out by the accumulation of smoke. I think my informant told me that, after forty-eight hours' operation in this manner, the hams would be found sufficiently smoked. He added, that beef, mutton, salmon, haddocks, &c., may be as effectually cured as hams by the same process. I am, &c.

ENORT.

Marlborough-terrace, Albany-road.

THE WEATHER OF 1834.

We have to thank a correspondent at Beccles (E. D.) for enabling us to rescue from the oblivious columns of a country newspaper, the following interesting table of the rain which fell during the past year as compared with the mean of a number of preceding years. It is extracted, along with the observations subjoined, from a letter to the *Bury Post*, by Mr. William Bassett, of Nether Hall, Thurston :—

	Rain at Thurston in 1834.	Mean quantity of rain according to the British Almanac.
	Inches.	*Inches.*
January	2.627	1.483
February	.432	.746
March	.54	1.440
April	.702	1.786
May	.54	1.853
June	1.215	1.830
July	3.545	2.516
August	1.555	1.453
September	1.195	2.193
October	.86	2.073
November	1.34	2.400
December	.85	2.426
	15.401	22.199

"Thus it appears that the quantity of rain was nearly seven inches below the average amount; and that January, July. and August, had more, and the other nine months less, than the usual supply. The rain in February, March, April, and May, was so very little—so far below the amount of evaporation (which, in so dry and warm a season, must have exceeded the average) that the subsequent rains only saturated the mould, and produced no overflow, e heavy land. The consequence has that springs have been lower than mo sons can remember them to have been a vast number of wells have been dee that ponds or meres have been dry low. To instance those not far from Barton mere became quite dry in July the end of November, of the meres Thetford, Langmere was completely Ringmere nearly so; and Foulmere dried up. The mere called the Pune was quite dry. These, I am informed never known to be dry before. The also in Wretham mere was never kno be so low. I wish that some person be induced to give an account of mo larger meres and lakes, such as Whi mere, and the lakes in the north of land, Scotland, and Ireland; or of t merous lakes in some countries on the nent. Rivers in England have been low, and streams dried up, which I t have not been so since 1803. If I rem correctly, Moore's Almanac for 1805 that the rain in 1803 was 15 inche a fraction, so that that year was, o whole, as dry as the last year was; and member that in that year I walked o hard mud of the river Brett, from Lave towards Brent Eleigh, which probably not have been done since, till the late mer. Notwithstanding the general cha of the year there were some very heavy in July. On the 7th of that month fell .92 of an inch in half an hour, wi thunder; and on the 29th there fell 1.44 These sudden rains filled many ponds, would otherwise have been dry. The was very partial; but the second seem be very extensive. The dry early m caused a very short crop of hay and ba but the rains in July, August, and Sep ber, produced a better crop of turnips was expected,

"I am, &c.

"WILLIAM BASSET

"P. S.—Ten o'clock, the barometer higher now (Jan. 3, 1835) than I ever it, namely, at 30.7 inches.* As water here which runs to Lynn, and within miles which runs to Harwich, the gr here must be nearly as high as any in folk, and of course the barometer must be comparatively low."

* C. C., of Balbourne, a letter from who another subject, is inserted at p. 269 of our p Number, informs us that, on the 2d of Janua observed the barometer still higher than "Yesterday," he says, "the one I have re what I consider an extraordinary height—na 30.42 inches, which is $\frac{1}{100}$ more than ever it wa year. On the 2d of January, 1834, at this p was exactly 30 inches."—Ed. M. M.

NOTES AND NOTICES.

Sky appears Blue.—When we see a through a white and thin one, it gives tion of blue, and this, says M. de la reason why the sky appears blue to immense depth being entirely deprived only appear to us through particles of re enlightened and appear quite white. *Ilfracombe.*

the Sea in the Straits of Dover.—ays (Trans. Roy. Acad., Paris, 1707,) on of the sea rising at the reflux of the Pas de Calais, or Straits of Dover, waters which retire from the coasts of eeting with those which retire at the rom the coasts of France, swell against and raise the middle of the Strait.—*Ilfracombe.*

Tape-School.—Science was, till very little comprehended at the Admiralty, ydrographical-office, at present their wel, was actually placed under the suee of a mere clerk! The coolness beirals Pellew and Trowbridge, respectision of the Indian station, by a line south of Point de Galle, in Ceylon, hose who framed the order not recolthe same line would cut Madras from ommander. During the retreat of Sir e, a cabinet minister, whose name was by the venerable narrator, called on mell to ask which was nearest to Falliz or Corunna? And we have all oise bruited about the *island* of Parga e men, who, as Johnson says, "laugh lecks at bravery and science."—*United rnal.*

of the Same.—When Lord Howe was he Magnanime, at Plymouth, he was press to London, in the year 1757, in ommand the naval part of an expee coast of France. George II., and the inet-council, seemed very much astoiis requiring the production of a map t of the enemy's coast against which tion was intended. Neither in the where the council sat, nor in any adt, was any such document; even in lty office, no other than an indifferent coast could be found. As for the adjaty, it was so little known in England, the British troops landed, their comignorant of the distance of the neighllages.—*Ibid.*

Water.—The *Richmond Enquirer* (U. S.) a remarkable case of preservation from luring a sudden freshet of the Kanawha water rushed into a large coal-bank, where two negroes were at work; they to escape, but found the entrance comed up; they then mounted on a pile the vault, and there remained in more ight darkness, and in the constant exf being swallowed up, for *two days and*. As soon as the waters began to subwere rescued by a boat from their perilon. "It is supposed," says the *En*hat the air which was confined in the the mouth closing first, prevented the a filling it. But it is not certain that t, or that the room in which they not above the water level." That the ght have been the case is extremely We remember having read, about two of some miners in Cornwall having l precisely in the way here supposed. driven by a sudden influx of water to *st corner of a shaft—pent* up within a space scarcely large enough to hold them—with a wall of rock behind, and *another of water* in front—and yet there they remained, in perfect safety, till the water was drawn off.

American Railway Performance.—"The following is a brief statement of the performance of a locomotive steam-carriage, recently built under my direction by Mr Baldwin, of Philadelphia, and now running on the Charleston and Hamburgh railroad. She started from Aiken, 120 miles from Charleston, on Thursday morning, at fifteen minutes past seven o'clock, with eleven cars loaded with cotton; at Blackville, 90 miles from Charleston, another load was added; at Medway, 72 miles from Charleston, two others were added; and at Branchville, 62 miles from Charleston, a fourth load was added: making, in all, a train of fifteen loaded cars. This immense weight, not less than 80 tons, including engine and tender, was delivered in Charlestou at seven o'clock, fifteen minutes, in the evening of the same day, notwithstanding delays on the road at the different stations of 4½ hours, making the running 7½ hours only for the distance of 120 miles. Numerous ascents of 20 to 35 feet per mile were overcome with this load; and what is of most importance, to those interested in railroads, the greatest weight on either wheel of the engine does not exceed 1½ tons."—E. L. MILLER. *American Railroad Journal.*

The Town Hall. Birmingham, and Fishmongers' Hall, London.—The Architectural Magazine for this month (an excellent number), states, that the design of the Birmingham Town Hall "was one jointly produced by Messrs. Hanson and Welch two years before, and was intended for Fishmongers' Hall, London." How mortifying! One of the finest architectural designs which have been produced in modern times, rejected, for one of the meanest! One of the fittest, too, that could have been possibly selected to embellish the main entrance to a great city! Let the reader only imagine to himself how such a building as the Birmingham Town Hall (see the view in our Magazine, No. 554, p. 403; or that in the Number just quoted of the Architectural Magazine,) would have looked at the city end of London Bridge; let him but contrast in his mind's eye the effect which its bold rustic basement, and magnificent columnar superstructure, would have had in such a situation, with the impression produced on a spectator, by the common-dwelling-house-sort of thing—with its paltry pilasters (apologies for pillars), and paltrier architraves—which now occupies the site of the old Fishmongers' Hall; let him but think of all this, and judge for himself, what an opportunity has been lost, as well by the architect as by his employers. After all, perhaps, we ought to be thankful that it is no worse; considering who his employers are, it may be regarded as a piece of great good luck for the City that they did not order it to be built of the form of a dolphin.

Steam-Boat Explosions.—The legislature of Louisiana has adopted a very severe, and, we trust, efficient law for the regulation of steamboats, so as to secure them from explosion. The number of fatal accidents on the Mississippi—particularly the disastrous one by which *Senator Johnston* lost his life—imperiously called for some legislative interference. The law establishes the office of state-engineer for New Orleans. The duty of the engineer is to examine once in three months, the strength of the boilers of steam-boats plying within the waters of the State—to test them by hydraulic pressure to three times the force of the steam they may be supposed capable of carrying—and to furnish each boat with a certificate, specifying the force of steam which may be safely used. In case

any accident happens on board a vessel, not possessing the proper certificates, neither captain, owner, nor agent, can recover any claim for freight or insurance; the owner or agent is made responsible to the shipper to the full amount of all damage; and the captain is further subjected to a fine not less than 600 dollars, nor more than 2,000, and to imprisonment for not less than three months nor more than three years. If lives are lost the captain is to be adjudged guilty of manslaughter.—*Baltimore American.*—So much for blowing up a *senator!* Friend Jonathan, with all his republicanism, knows, it would seem what is due to high rank, as well as his neighbours. For some years past scarcely a file of American papers came to hand which did not contain an account of some steam-boat having been blown up, and numbers of persons being killed by the explosion. But there was never a senator among the slain, and so the blowing up went on, without the senators of the Union ever troubling their heads about the matter. Behold, at length, Mr. Senator Johnston projected into the air, amidst a crowd of common folks (happily for humanity, however sadly for the individual), and instantly the evil of long standing becomes one of a most intolerable nature, which must be put down by the severest pains and penalties that can be devised!

Beer drinking Britons.—Professor Jack, of Bamberg, in his Travels in England, published in 1825, observes, by way of giving his countrymen an idea of the extent of the consumption of beer in England, that, although the city of Bamberg is famous for its beer, and supports no less than sixty-six breweries, the whole sixty-six do not produce so great a quantity as the single London house of Reid and Co. And yet (the worthy Professor remarks) *that* is not, by any means, the largest porter-brewery in the English metropolis.

The Short Passage to India effected.—It is reported that the Forbes steamer, which, it may be recollected, stopped short at Madras, on its first intended trip to the Red Sea, on account of the bursting of its boiler, has arrived at Suez, with letters to the date of the 3d of September, which, of course, may be hourly expected here. Some unexpected delays must have again occurred, as it was calculated that the passage by the Red Sea might be accomplished in about half the time that this appears to have taken.

Iron-Castings.—Mr. Avery, the proprietor of a large iron-foundery in Syracuse, State of New York, has ascertained, by a series of experiments, that if common fine sand is mixed with common blue clay, in the proportion of one-tenth part of clay to nine-tenths of sand, it constitutes the best possible composition for casting that can be used. Even the most delicate castings come out perfectly free of sand, and require no sort of cleaning by vitriol.—*Brattleborough Independent.*

Southwark Literary Society.—This Society is still going on prosperously, the total number of members being little short of 500. A quarterly general meeting was held on the 6th inst., when the committee laid the accounts before the meeting, from which it appeared that the funds are in a favourable state. Several contributions to the library and museum have been received from members during the last quarter. The classes already established are a French class, a mathematical class, and a music class. The annual meeting for the election of officers took place on the 13th inst., when two gentlemen were proposed as presidents, viz. J. P. Thomas, Esq., who has hitherto filled that office, and E. L. Bulwer, Esq., the celebrated novelist. Upon the result of the *ballot being announced*, it was found that Mr. *Thomas had a majority* of 62 votes above his talented competitor, and he was consequently declared president for the ensuing year. The other officers were re-elected.—Pit, *Jan.* 14.

The Dublin and Kingstown Railway is a great source of attraction to the inhabitants of the Irish metropolis. On the day of opening (December 17,) there were about 3,000 persons; on the day after Christmas nearly twice as many; and every day since between 3,000 and 4,000. The daily receipts from passengers also are already above 70*l.* The carriages are distinguished for their performances on this line, and those of Forrester, of Liverpool. The patent spring-connectors, continue to answer well. When the trains stop and proceed without the passengers experiencing, in the slightest degree, the shocks or concussions which have been so much complained of on the Liverpool and Manchester, and other railways. They are the invention, we believe, of Mr. Vignoles, the talented engineer of this splendid and successful undertaking.

The Eastern Counties Railway, which is to run from London to Yarmouth, by the way of Romford, Colchester, Ipswich, and Norwich, is the one of the most level—for its length—in the whole kingdom. According to reports of the engineers, there will be no greater rise than 1 in 400; no embankment more than 28 feet high; and not a single curve throughout its whole length. The average mile will, in consequence of these singularly favourable circumstances, be less than that of any other railway constructed, or in progress of construction, in Great Britain. The estimated revenue are also extremely encouraging. There being no canal communication between the metropolis and the counties of Essex, Suffolk, and Norfolk, there is a greater waggon traffic on this line than on any other in the kingdom. The passenger traffic is also so considerable, that it will of itself suffice to pay all the expenses of the railway, and leave a handsome profit to the proprietors.

We shall write to Mr. Marsh in a day or two.

We cannot insert the statement of "V" on the anonymous authority. If he will favour us with his name, confidentially, that may possibly be done.

Communications received from E. [illegible] Tiosit—P. T. P.—Mr. J. N. William[illegible] tificus.

The Supplement to Vol. XXI., with a Memoir on Steel, of the late Mr. Telford, is now ready. Price 6*d.*; also the Volume complete, in boards. Price 8*s.*

☞ The Editor of the Mechanics' Magazine has made such arrangements as enable him to offer, on unusually advantageous terms, his assistance to take the solicitation of Patents for New Inventions, the drawing and revising of Specifications, and generally every other branch of Patent business. Drawings of Machines executed with accuracy and dispatch.

6, Peterborough-court, Jan. 3, 1835.

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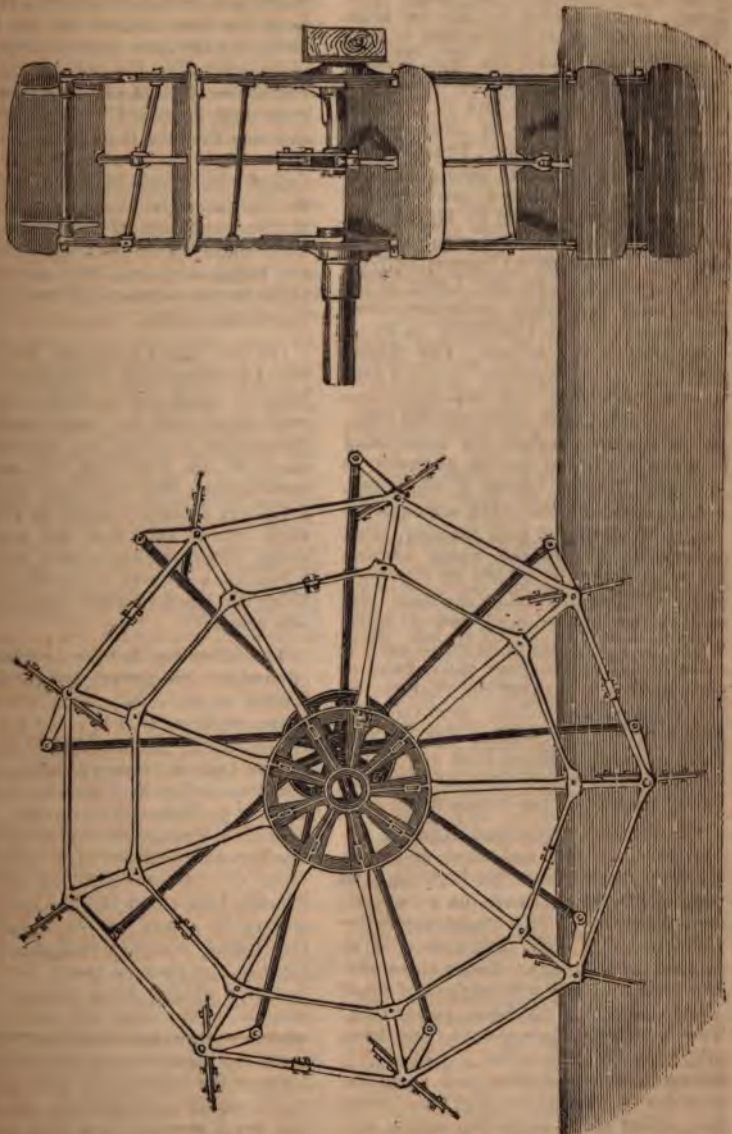


MORGAN'S PADDLE-WHEEL.

MORGAN'S PADDLE-WHEEL IN ITS LATEST AND MOST APPROVED FORM.

The paddle-wheel now commonly known by the name of *Morgan's*, was originally invented by Mr. Elijah Galloway, and patented by him in 1829. The first trial made of it was on board a steam-vessel, of which Mr. Wm. Morgan was the principal and acting owner, who was so much pleased with its performance, that he became by purchase the proprietor of the patent. The Commissioners of the Admiralty were afterwards induced to order that a pair of these wheels should be fitted by Mr. Morgan to H. M.'s steam-vessel Confiance. On the 9th of Sept. 1830, Commodore Warren, accompanied by Mr. Lang, of the Dock-yard, Woolwich, proceeded down the Thames in the Confiance, on an official trial of the wheels. The Report made by the Commodore to the Admiralty was—"That with 23½ revolutions of the engine (24 to 25 revolutions being their regulated speed) the vessel had improved in speed (as far as could be collected from so limited a trial) from 1 to 1½ knot an hour; that, although the floats, in leaving at such rapidity, must necessarily disturb the water, so perfectly were the ill effects of the back water obviated, that when the vessel was going at her utmost speed, he had caused a wherry, which was being towed a-stern, to be hauled up alongside, and close up to the paddle-box, without the slightest inconvenience, or without her shipping even a spray; and, finally, that the previous vibration suffered from the action of the wheels was so reduced as to be barely sensible on the paddle-box itself."

On the 11th September, Admiral Sir George Cockburn embarked on board H. M.'s steam yacht the Lightning, to proceed to the channel, on an experimental cruise, H. M.'s steam-vessels the Confiance and Echo being ordered to proceed in company. These three vessels were all fitted with engines of equal power—namely, 100-horse power each. The Lightning, however, having been originally laid down for a steamer, is fifteen feet longer, three feet narrower, and draws nearly two feet less water than either of the other two vessels, and from her superior swiftness and other *qualities, was selected* for H. M.'s steam *yacht. The Confiance* and Echo are in every respect sister vessels, w down from the same drawing, a originally intended for gun-brig three vessels were started a-b signal from the Vice-Admiral. provement in the Confiance was from the first starting, as she abled to keep even pace with th ning, whenever the revolutions engines reached 23, and to pass h ever they exceeded that veloc this way they ran together to the where they anchored. The E though previously of equal spe the Confiance, fell back so rapid at the expiration of the first h Vice-Admiral made her signal t she being then two long miles Hitherto the weather had been c the water smooth.

On the 12th September, the sels, Lightning and Confiance, dered to weigh, and to stand to t wind fresh, and sea rough a-he cumstances in which the previo riority of the Lightning had be remarkable. The lead was no ever, very decidedly taken by th ance, whose gain over her co under these circumstances, wa a half knot on seven miles per h being the speed at which the Li was driven.

The following day the Confia ordered to Newhaven, and acc started at 8½ A. M., wind stro heavy sea from W.S.W. At 4 Beachy Head, she passed H. M.'s Carron (which vessel had left th five hours before her), making th her way to Plymouth on service. performed the service required of Confiance was ordered back to W where she anchored Sept. 14. T mander Lieutenant Belson, hav ordered to report on the beha the wheels, stated, "that the ment in the vessel's speed was tionately greater in a sea-way smooth water; that the action wheels was no way impeded b the waves, since the variation i locity of the engines did not ex to two revolutions; that the ves was never stopped; and that t no sensible increase of vibratio paddle-boxes during the gale, very slight tremor felt in smoo

The commanders of H. M.'s steam-vessels Carron and Confiance, having received orders to proceed on a further experimental cruise to Cape Clear, and thence round the Fasnet Rock back to Plymouth, these vessels, similar in every respect, excepting in their wheels, started from the Breakwater, by signal from the Port-Admiral, on the 1st of October, wind strong and a rough sea from the W.S.W. In five hours the Carron was hull down a-stern. The Confiance anchored at Hamoaze on the 4th of October, and the Carron on the 5th. The Confiance performed in 54 hours the distance which occupied the sister vessel, the Carron, 84 hours in running. Independently of the great saving of fuel effected, namely, 10 bushels per hour on the time saved in running the same distance as the sister vessel, viz., 30 hours, other advantages have been secured by the modification in question, as may be collected from the reports officially made, jointly and separately, by Lieut. Potburry, then commanding the Confiance, and Lieut. Lapidge, in command of the Carron. In reply to the questions put to them by the Admiral commanding at Plymouth, in virtue of directions from the Commissioners of the Admiralty, these officers stated, "that the Confiance had, on a comparison of their respective logs, gained by the alteration in her wheels an increase of speed of 2 knots on 7 in smooth water, and of 2½ knots on 4 to 4½ knots in rough weather; that the action of the paddles did not bring up the engines or retard their velocity in a head-sea; that in rolling, their action assisted in righting the vessel, and that the wear and strain as well on the vessel as on the engines was materially reduced."

The superiority of the new wheel was considered to be so decisively established by these trials with the Confiance, that Mr. Morgan was subsequently employed by the Lords of the Admiralty to apply it to the other Government steamers—the Flamer, the Firebrand, the Columbia, the Spitfire, and the Lightning. We extract the following particulars respecting the performances of these vessels, from the evidence lately given on the subject by Mr. Morgan, before the Select Committee on *Steam Navigation to India*, and *from the official reports of their respective commanders to the Admiralty*:—

The Flamer displaces 590 tons (including 120 for engines, 140 for coals, and 30 for stores); her cylinders are of 42 inches diameter, and 4 feet stroke; and her wheels 18 feet in diameter, and 5 feet 6 inches wide. When the vessel is deep, her wheels revolve from 14 to 20 times per minute in rough water, and 26 times per minute in smooth. When the vessel is light, the speed of the wheels is increased from 18 to 22 revolutions in rough water, and from 26 to 26½ in smooth. The commander of the Flamer, Lieut. Bastard, in report of 23d Jan., 1834, says of the wheels, "in six weeks of most tempestuous weather, found them to act remarkably well, without even a single float being shifted."

The Firebrand was built on the same lines, and is of the same scantling, as the Flamer, with the exception of having 9 inches more depth; she had also originally 20 horses more steam power. Her paddle-wheels were at first of the common sort, and then her velocity was three-quarters of a mile less than that of the sister vessel, with wheels of Mr. Morgan's construction. But since the Firebrand has been supplied with Morgan's wheels, she has attained nearly the same speed as the Flamer; and this though her old engines have been replaced by a new pair, of no greater power than those of the Flamer—namely, two sixty's.

The Columbia, as originally constructed, displaced altogether 480 tons; her engines were of 120-horse power, and her wheels (of the common sort) 16 feet 6 inches in diameter, and 8 feet wide. Her performance was then from 14 to 16 revolutions per minute, when she was deep; and from 24 to 26 revolutions per minute when light—the weather in both cases favourable. Being afterwards supplied with a pair of Morgan's wheels, 17 feet in diameter, and 5 feet 2 inches wide, with a new pair of engines of only 100-horse power, and with 30 tons more of coal, making her total displacement 14 tons more than before; the wheels performed, in similar weather, from 20 to 25 revolutions per minute when she was deep, and from 26½ to 28 when light. "She obtains," says Lieut. Ede, her commander, "greater speed than with the superior power she had before and the old wheel. The new wheels save the engines."

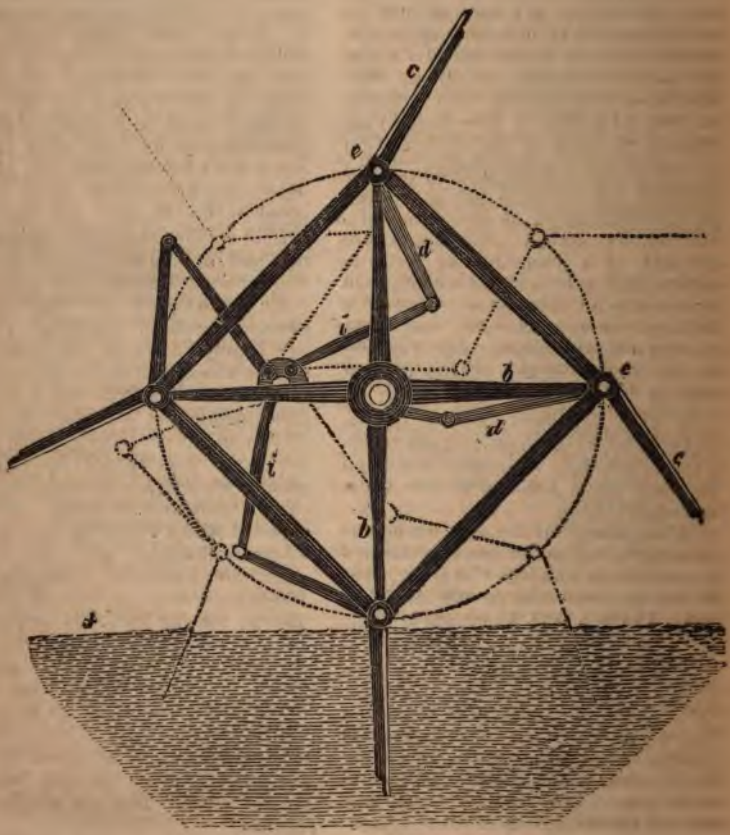
The Spitfire, with engines, coals,

&c., displaces 715 tons; her engines are of 140-horse power, and her wheels 20 feet in diameter, and 4 feet nine inches wide. Number of revolutions, when light and in smooth water, 23 per minute. Lieut. Kennedy, the commander of the Spitfire, in his report, of date the 3d Dec. 1834, says, "Had put to sea with the wheels in weather in which it would have been madness to attempt in any vessel with the common wheel, but that she had gone over it 4½ knots an hour, without scarcely feeling the wheels moved. With the old wheels would have been forced to put back, but had with these (Morgan's) made his passage from Gibraltar to Falmouth, against a heavy gale nearly the whole way."

The Lightning has been before described. Her commander, Mr Allen, in reporting on the effect produced on her rate of going, by the adoption of Mr. Morgan's wheels, says, that "the speed was much improved in heavy weather," and "the vibration nearly done away with."

The wheels of the Medea, the largest war-steamer yet constructed by the British Government, the Tartarus, and Blazer, are also on Mr. Morgan's plan.

The only private vessels in which Mr. Morgan's wheels have as yet been adopted, are the Queen of the Netherlands, belonging to the General Steam Navigation Company, and three foreign vessels, owned by British subjects.



During the last summer, Mr. Morgan was employed to fit a pair of his wheels to his Sardinian Majesty's steam-vessel Gulnare; and it is from these wheels, the latest (we believe) manufactured by Mr. M., that the drawings on our front page have been made.

The wheel, as now constructed by Mr. M., embraces a good many improvements on the original design of Mr. E. Galloway. The most prominent difference is an increase in the number of radial arms and paddles from four to nine. To show how much the wheel has gained from the successive modifications which experience has suggested, we shall subjoin an engraving and description of it in its original form, as given by Mr. Galloway himself, in his "History and Progress of the Steam-engine:"—

"The object of this wheel is to provide a remedy for the loss of power, and other inconveniences arising from the oblique position in which the float-boards of the common paddle-wheels enter and leave the water. This the inventor purposes to effect, by causing each float-board to turn, or rather vibrate, on an axis at its edge next the centre of the paddle-wheel, through the medium of projecting levers, firmly fixed to the float-boards, at their axis of motion, and connecting rods proceeding from the extremities of these levers to the extremity of a *fixed crank*, adjustable at a given distance from the centre of motion of the paddle-wheel, which consists of four radiating arms, connected at their extremities by strengthening braces; *b b* represent the four arms of the wheel, and *e e* the strengthening braces; *c c* are the paddles, firmly fixed to which are the levers *d d*, forming angles of about 120 degrees with each other, and turning together on axes at *e e*; *f* represents the water-line; *g* is the crank, fixed centrally to the axis of the wheel, but so as not to revolve with it; this crank is alterable at pleasure, by means of a set screw, which causes the paddles, through the medium of the connecting rods *i i i*, to take such an angle with the water-line as may be deemed most desirable for propelling; the rods *i*, however, are connected to a revolving collar on the crank, which allows of free rotary motion, while it draws the paddles uniformly into the positions shown in the engraving, when the arm of the crank is set in a horizontal position, as represented. The dotted lines show the position the paddles assume in the intermediate parts of their revolution, or the relative position they would take *if there were eight* paddles attached to the wheel."

THE CHILDREN CHIMNEY-SWEEPING ABOMINATION—CHIMNEY THAT REQUIRES NO SWEEPING.

Sir,—I am pleased to find your correspondents have revived the subject of mechanical chimney-sweeping. So barbarous a custom as that of using human beings for chimney-brushes, is a disgrace to the humanity of the age; and if more efficient means for the purpose could not be contrived, would be an equal disgrace to the science of the country. I fear, however, that unless the practice shall be abolished by an Act of Parliament, positively forbidding the use of climbing-boys, under very heavy penalties, there will always be found many individuals so rivetted to our "good *old* customs," that the present generation, at least, will not see it laid aside.

I have been also much gratified to find some of your scientific correspondents turning their attention to the improvement of chimneys. The suggestion of Junius Redivivus, to make use of quadrangular iron flues, is a step forwards; but I think it would be a greater improvement to make them cylindrical. A brother of mine, three or four years ago, built a house, all the chimneys of which were made of cylinders 9 inches in the clear, constructed of Roman cement, the ends fitting into each other, and he finds that they answer extremely well: they were built up in the walls with 4-inch brick-work, on each side next the rooms. There is a brickmaker in this neighbourhood who makes such cylinders of brick-earth. I saw, a few years ago, what I take to be a still better plan, in a work, the title of which I cannot recollect, although I am almost sure it was the Transactions of the Society of Arts. It was a plan for the construction of chimneys in such a manner as *never to require sweeping*. As I perfectly recollect the construction, I will describe it. It consisted simply in placing the chimney 1 or 2 feet on either side of the place intended for the stove. Thus, let *a* be the chimney, open quite to the ground; *b* the situation of the fire-place; and *c* a short flue to convey the smoke into the chimney.

The philosophy of the contrivance is this:—As the stream of hot air from

the fire-place comes in contact with the column of cold air in the chimney, the particles of soot are detached and precipitated to the bottom of *a*, whence

they may be withdrawn by a door, which should be made to fit close, and which need not be any disfigurement to a room, as it may be made to resemble the door of a cupboard, or a sliding panel of the wainscot may be made to serve the purpose. If the chimney is on the outside of the house, the opening may be made there, and thus the soot be withdrawn without any interference with the interior. The short flue should be occasionally swept by the servant.

I am, Sir,

A constant reader from the beginning,

P.

Chelmsford, Dec. 19, 1834.

MR. HALL'S STEAM-ENGINE IMPROVEMENTS.

Sir,—I have just read Mr. John Braithwaite's letter in your Magazine of this week.

Mr. Samuel Hall and myself have been on a footing of intimate friendship for more than twenty years. He has confidence enough in me to ask, and to follow, my advice in matters about which he does not chuse to act on his own single, unconfirmed opinion. I counselled him long since not to suffer himself to be drawn into any epistolary controversy on the subject of his inventions, and be determined to abide by that *counsel*. Many people think that when they have obtained their patents they may sit down with folded arms, and that out of their red boxes will flow, spontaneously, fame and wealth. Mr. Hall, and I also, have had too much experience not to be aware that there is required much talent to work a patent, after it is obtained. The duration of the patent is fixed, and, for an invention to be used by comparatively but few members of the community, is not too long. In the case of such an invention, the patentee, if he would reap the full fruit of his ingenuity, must, particularly in the early part of the term, exert himself unremittingly to make the invention generally known, and to shew, by its effects, that mere speculative opinions upon it are of no value. This Mr. Hall has been, and is still, doing. I trust nothing will divert him from that his steady purpose.

Mr. Hall's patent for gasing lace was attacked just as his present inventions are attacked. When persons went further, and infringed, he taught them by appealing to the law, and greatly to their cost, that they would have done wisely in abstaining from intruding on his property. He supported his patent, and against all assaults, of all descriptions; it has nearly run out, ever, as he deserved it should be, a source of remuneration to him.

If Mr. John Braithwaite imagines he is the inventor of the improvements which Mr. Hall claims as his own, Mr. Braithwaite will, I assure him, have to contend for the merit of the invention against plenty of competitors as imagining as himself. I lament to observe, that no sooner does any new thing, in the way of improvement, make its appearance, than speculators will immediately enter *fishing caveats* (if I may be allowed the expression), in periodical works, against it. You, as a man versed in patent practice, will very well know what I mean. To all such I have only to say, they ought never to be noticed but in a court of justice.

As to Captain Martin, that gentleman is perfectly well able to take care of himself; and if Mr. John Braithwaite brings him into action, the captain will not, in my opinion, have the worst of the fight.

I am no engineer, and, therefore, can-

not speculate on the subject of a vacuum; but I will beg Mr. Braithwaite to refresh his memory. Did he not only a few months ago, in my presence, intimate to Mr. Hall, boastingly, that he had obtained a vacuum of *fourteen* inches?

The merits of Mr. Hall's invention is evidenced by its success, recorded in your pages. If any one claims the invention, the course is open; let him appeal to the law: Mr. Hall is perfectly ready to meet all comers.

Mr. Hall never will, I trust, be induced to consume his time, most valuable as it is to him, and as it will be for many months, perhaps some years, in the war of assertions, denials, replies, rejoinders (to use the phraseology of my profession), rebutters, and surrebutters, in which the parties engaged never fairly join issue, and which leaves the public no better informed than before the contest commenced.

I remain, Sir,
Your obedient servant,
ARCHIBALD ROSSER.

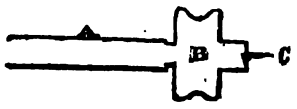
15, New Boswell-court, Lincoln's-inn,
January 16, 1835.

P. S.—I avail myself of this, the earliest, opportunity, to thank your correspondent, Mr. Baddeley, for the gratifying manner in which, in No. 585 of the Mech. Mag., he speaks of the appeals I had, through your kindness, the pleasure to make in favour of children chimney-sweepers.

EASY METHOD OF DRILLING HOLES IN GLASS FOR PHILOSOPHICAL INSTRUMENTS.

Sir,—Having discovered what I consider to be a new and also very superior method of cutting holes in plate-glass for electrical and other machines, and also of cutting glasses for optical instruments, I am induced to send you a description of the same, in order that it may be beneficial to others. I will first describe the instrument necessary to be made for the purpose, and then state how it is to be used.

Make of thick sheet-tin a tube 3 or 4 inches long, the diameter of which, measuring from the *outside* edge, must be somewhat smaller than that of the hole required. Let this tube be *converted into a drill thus:*—



A is the tube; B the head of the drill, turned out of wood, part whereof goes about an inch into the tube; C is a piece of iron wire for the pivot. The open end of the drill should have a few notches made in it with a file, so as to admit the emery, necessary to work with facility.

Determine the size of the hole you want, say half an inch in diameter; then cut such a hole in a piece of flat wood, being not less than 2 inches square, and half an inch thick; next mark on the plate-glass the situation of the hole wanted; take some melted bees' wax, with or without rosin, and fix the piece of wood on the glass, having the hole exactly over the place previously marked; place the glass on something flat, whereon some baise or carpet has been first laid, to prevent the glass from sliding during the process; mix plenty of grain emery with water, and put it into the open part of the drill; now place the drill in the hole of the wood, and with a breast-plate and drill-bow, about 2 feet long, commence drilling. You must work at first very slowly to avoid chipping the edge of the glass, and afterwards proceed at a quicker rate, always taking care not to press on the drill more than sufficient to keep it steadily working, for otherwise there will be great danger of breaking the glass. When the drill is almost through the glass (which may be ascertained by looking at the other side of it), you must remove the carpet or baize, above alluded to, to obviate the danger of chipping the edge of the hole, and then proceed very slowly until the operation is quite finished. You will thus obtain a clean-edged circular hole, with a corresponding piece of glass, and this without incurring the least risk of breaking. In this way a piece of plate-glass, a quarter of an inch thick, may be cut through in less than ten minutes.

I have adopted this mode of cutting holes in plate-glass for electrical machines, and it is obvious that it may be also applied to the cutting of glasses for

optical instruments. Here, however, the diameter of the *inside* of the drill must, to allow for friction, be a trifle larger than the diameter of the glasses required; for if no allowance be made, it will be found that the piece of glass will be somewhat smaller than was required.

I am, &c.

F. H.

Bath, December 29, 1834.

THE ROYAL PATENT PURIFYING SEA-WATER COMPANY — MR. WELLS IN REPLY TO LIEUTENANT BAKER.

Sir,—I trust you will do me the justice to insert, in your widely-circulated Magazine, my reply to a letter, upon the subject of "converting sea-water into fresh," from a Mr. Baker (of whom I never before heard), which letter appeared in your last, No. 596. Mr. Baker therein charges me with taking an improper advantage of some communications, said to be made to me by a Mr. Fraser, relative to his apparatus for a similar purpose. A statement of a few facts, which I am ready to verify upon oath, will be the best refutation of the calumnies contained in Mr. Baker's letter.

The patent for converting sea-water into fresh, in which I am interested, was sealed at the Patent Office in *May*, 1831, more than two years before either myself or my partner, Mr. Westrup, had ever heard of Mr. Fraser, or his patent. The fact is, Mr. Fraser was first introduced to me by Captain Gibbs, in *November*, 1833, as a suitable person to superintend the manufacture of our machines; but his terms not being approved by my partner and self, all intercourse ceased, and I have never seen Mr. Fraser since. We had but three interviews with Mr. Fraser, and never received any information from him relative to his apparatus.

When our patent and specification were shown by me to Mr. Fraser, he declared it, in his opinion, to be the most perfect and unexceptionable specification he had ever seen, and actually offered Mr. Westrup and myself 2,000*l.* per annum for the exclusive sale and manufacture of our apparatus (a fact, *which we have witnesses* to prove), which *demonstrates that* he did not consider we had infringed his patent. Mr. Fraser also stated to me, in the presence of several individuals, that had he known our peculiar mode of condensation, he should at that time have realised by it a large fortune.

Mr. Baker's letter sufficiently admits the great utility and advantage of such an apparatus to the nautical world; its adoption, therefore, becomes of national importance. Now, sir, if such be the fact, surely the union of influential individuals, in the navy, merchants' service, and the commercial world, may be considered the most likely means of obtaining the adoption and extension of the beneficial effects of that which is admitted by all to be a grand desideratum. I am quite aware that the principle has long been known, and therefore we never pretended to originality in that respect. It is presumed that a candid public will, upon reflection, perceive the futility of Mr. Baker's remarks, and duly appreciate that gentleman's motive; and at the same time acquit me of having, as insinuated by him, attempted "to squeeze the orange dry," as he elegantly expresses it.

I have the honour to be, Sir,
Your very obliged servant,
J. Wells.

56, Walcot-place, Lambeth,
January 15, 1835.

P. S.—I cannot but admire Mr. Baker's laudable attempt to publish our improvement of what he ignorantly calls giving to the water the carbon which it lost in distillation, which, in fact, would be to communicate to it a poisonous quality. He has mistaken carbon for carbonic acid gas, which latter impregnates the water, and causes the sparkling quality so pleasing in spring water, and which, with the removal of the empyreumatic flavour, is *my own discovery*.

PADDLE-WHEELS — ROCKETS — SHOT-PROOF SHIPS — STEAM-CARRIAGE BOILERS.

Sir, — In your 596th Number "a new suggestion" is introduced by your correspondent J. L. S., of a propeller for steam-vessels in lieu of the paddle-wheel. In 1827, I presented a plan, precisely similar, to the Duke of Clarence, then

Lord High Admiral. I had several conferences at the Admiralty on that subject, and on others of more importance, with Admiral Sir Edward Owen. I was told, that if I would, at my own expense, fit out a steam-vessel with those propellers, or with a paddle-wheel (which I at that time had the honour to show you, Mr. Editor), and it should be found to answer, it would *then* be taken into consideration. I have Sir Edward Owen's letters by me, containing this notification. Sir Robert Seppings afterward told me the same thing.

I proposed to work my propellers, directly from the piston-rods of the engines, by a simple connecting rod, and as low under water as possible. The only variation of my propellers from those proposed by J. L. S., was, that I constructed a square frame of flat irons, with six or more flaps, which opened and shut like a Venetian blind. When such propellers consist of only two large flaps, part of the stroke is lost, from the time which it takes for the flaps to open, &c.

Amongst other things, I have invented a rocket which, with a range equal in extent and more correct than Congreve's, *infallibly* sets fire to the sails, cordage, yards, &c. of an enemy's ship, in which I can lodge more than fifty in a minute. I offered to exhibit it, and to prove all this to the said Lord High Admiral, but his Highness said, that "he should be very sorry to be instrumental in introducing such means, which were only calculated to place, for a time, the weak on a level with the strong; and that England being the stronger at sea, had no occasion for any thing of this kind." To this I replied, that it might be desirable and wise for the stronger to prevent the weaker party from becoming possessed of a dangerous weapon, by taking it themselves, whether for use or not. But my hint was not *taken*, and there the matter rested!

Confiding in the great increase of intelligence amongst men, I hope and think that it will be a long while before our rulers will be permitted to involve us in another war; so I see little chance of using my rockets, or other things, either for or against "the stronger party." It has struck me, however, that I might, by exhibiting *them to the public*, be of *signal service to several branches* of our *own home British industry*—that is, our collieries, iron-works, steam-engine manufactories, &c. The application of steam to navigation is marching rapidly onwards; but the general knowledge of my rocket would *compel* it to advance in "double quick time," as no sailing vessel, rigged according to the present system, could avoid being either burnt or captured by the smallest privateer or pirate (especially if a steamer), that could venture for a few minutes within two thousand yards of her.

In 1826, I laid before the Master-General of the Ordnance a paper on a "*shot-proof steam-ship*," to be armed with *only two* guns, for projecting twelve-inch shells *horizontally*, and a frame a-midships, to throw volleys of 10 to 30 of my 24 lb. rockets in a minute. I find they are beginning to feel the absurdity of employing solid shot, and *have* built some large steamers, armed with two bomb cannon, for the horizontal projection of shells; but I do not know whether they have adopted *my* plan for rendering the vessels shot-proof. If they have not, they will be *compelled* to do so, whenever they shall have occasion to use *their* steamers against an enemy not so blinded by the ignorant self-sufficiency of routine.

I have read with interest a paper, in your last Number, on the communications across the Isthmus of Panama. I have a communication to make to you on that subject, which I think you will find to be important; but it is not in my power to send it you till next week. Meantime,

I have the honour to be, Sir,
Your obedient servant,
F. MACERONE.

Jan. 13, 1835.

P. S.—I forgot to mention that the receiver, or steam-chamber, at the top of my boiler, represented in No. 596, has not been constructed according to the scale of the drawing, where I have represented it as of twelve inches diameter; it is only seven. It is of the best charcoal plate, quarter inch thick, the ends half inch, with 5-8ths bolt from from end to end. Experienced working engineers think it would stand more than two tons pressure to the inch surface. It has been proved at 2000 lbs. by means of Bramah's hydraulic pump. The outer rows of the cylinders composing the boiler are half an inch less in diameter

than all the others, which make them considerably the stronger. Upon the occasion of the boiler, as you mentioned, having been purposely pushed to bursting, it was one of the fire-bar tubes which opened about 1-16th of an inch, in a length of seven inches, being a mere gas-pipe, "butted" and welded, instead of lapped and welded. Those I have now are lapped, like a gun-barrel, and will stand at least three tons to the square inch. Mr. Russell, the gas-pipe-maker, tells me that he has made pipe of an inch bore, and 3-16ths thick, to stand four tons to the inch! This is not so surprising, when we reflect upon the pressure resisted by a gun-barrel on the explosion of the powder.

PLAN FOR PREVENTING ACCIDENTS FROM THE BREAKING OF THE AXLES OF RAILROAD CARS AND LOCOMOTIVES. BY MR. JOSEPH S. KITE, OF PHILADELPHIA.

Report by the Committee on Science and Art of the Franklin Institute.

It is well known that the fracture of such axles almost invariably takes place near the nave, or hub, of the wheel; and the desideratum in such a case, is to preserve the two pieces of axle from *falling to the ground*, and, consequently, overturning the car. This, Mr. Kite proposes to effect, by introducing in each car two longitudinal pieces of timber (which he calls *safety beams*), inside of the wheels, and parallel to the usual string pieces, which support the boxes or chairs of the axles. To these inside beams are attached an additional set of chairs, which, in order to avoid unnecessary friction, are so arranged as not to come in contact with the axle, except when the latter breaks.

When this happens, they arrest the descent of the pieces, and thus not only retain the car in an upright position, but may even permit it, in some cases, to proceed as before. These chairs are so constructed with double bearings, as to allow play to two axles of different diameters, the *smaller* bearing being for the axle *proper*, and the *larger* one for the *nave of the wheel*; which, if the break takes place immediately at the union of the hub and axle, becomes itself a *temporary* axle, upon which its attached wheel revolves, independently of the axle *proper* — the latter, with *its* wheel, being supported by the *smaller* bearing of the double *chair*. The wheels are prevented from separating *transversely*, by means of proper *keepers outside of the chairs*.

The Committee consider Mr. Kite's arrangement both effective and simp consequently recommend it as desc practical test.

IMPROVED SPIRIT-LEVEL FOR R OPERATIONS. INVENTED BY M CAMPBELL, OF PHILADELPHIA

Report by the Committee on Science and Franklin Institute.

Considerable difficulty has hithe experienced in railroad field op from the want of an instrument whi combine the common spirit-level wit rect circle for laying off angles, wi cient accuracy for the tracing of cur which, at the same time, would a pitching, or inclining, the telescope, the necessity of throwing the parall out of adjustment. In the tracing o the union of these qualities is par desirable, the operation having generally required two separate inst viz. the common compass, and th level. The former, besides never b vided with that degree of minutene is necessary for a proper executio work, allows, through its upright field of view entirely too large to d points of curve in a satisfactory Mr. Campbell's improved level obvia disadvantages in a perfect mann improvement consists in the *combi* the common level, with a circle divi minutes; a screw is attached to on Y's, as in the old English levels, b the telescope may be so inclined as t points of curve on a sloping surface, throwing the divided circle out of a l tal position; a compass is so applie be attached and detached at pleasur

SEBASTIAN'S MACHINE TO PROV PROPORTION OF THE FALL OF B

(Abridged from the Transactions of t Academy of Arts, Paris, 1699.)

The ingenious hypothesis of Ga the proportion according to which th ness of falling bodies increases, henceforth established in physics. viding into equal parts the time of of a body, we know that in the sec ment it goes through three times m than in the first, five times more in t and so on, according to the odd n But this hypothesis, so convenient culation, and so probable in reaso however, not good at the bottom, an wise than as it agrees with experie this is not very easy to prove in a gree of exactness.

For this purpose, F. Sebastian has conceived and very exactly executed a machine, which seemed to him more fit to prove the system of Galileo, than the other experiments which have been made with the same design.

This machine is composed of 2 or 4 equal parabolas, which intersect at the top by making equal angles, and have a common axis perpendicular to the horizon. This forms a paraboloid, about which there turns a spiral, composed of two parallel brass wires, which make a very narrow inclined plane, and so disposed, that the first turn of the spiral being 1 inch in diameter, the second is 3, the third 5, the fourth 7, &c.

These turns of the spiral, which are to each other as their diameters, are the unequal spaces which the falling bodies must go through in equal times. We see, therefore, that if we let a little ivory ball, of 6 inches in diameter, fall from the top of the paraboloid, and pass through the whole inclined spiral plane, it will pass through all the turns in the same time; and this will appear still better if two equal balls turn about a paraboloid at the same time, and at some distance from each other; for when one has seen them pass in the same instant over the same arc of one of the parabolas, one sees that they continue to go always together, and to be found at the same instant over every other arc whatsoever, though being at different heights they go through very unequal turns of the spiral.

R. W. D.

Ilfracombe, Jan. 19, 1835.

STEREOTYPE METALAGRAPHIC PRINTING.

Invented by Dr. Alexander Jones, of Mobile, Alhabama.

(From the American Journal of Science.)

Stereotype Metalagraphic Printing means simply the transferring of printed letters, from the pages of a book, or newspaper, to the polished surfaces of metallic plates, especially of soft iron. My experiments are not yet completed, yet I feel satisfied that the result is entirely a practicable one, if carefully conducted with proper instruments.

The best plan on which to conduct the experiment is as follows:—Take two plates of very soft iron, of moderate dimensions, give one face of each a very true and fine polish, so that when applied by these faces, they shall uniformly fit and adhere together. Moisten two slips of printed newspaper, or parts of a leaf from a book, of the size of the plates, apply one to the polished face of each plate, and interpose between them a fold or two of silk paper, and then clamp the plates together. Give them a gentle heat over the fire, then place them in a vice, and apply a strong screw power. On separating them and gently removing the paper, the letters will be seen distinctly formed on the faces of the two plates. Now, as printers' ink is formed of *lamp-black and oil*, upon which acids act very little, the faces of the plates may be slightly touched over with diluted sulphuric or nitric acid, which, if skilfully applied, acts on the iron, and leaves the letters raised. When the printers' ink contains some bees'-wax, the experiment is more complete. These plates, once formed, may be converted into steel, on the plan of Mr. Perkins; after which they would probably print from 10,000 to 20,000 copies without being materially defaced. An expert mechanic, with proper machinery, could in a day or two form a sufficient number of plates to print off 20,000 copies (500 pages) of an octavo volume.

Other metals, as copper, brass, and type metal, with slight variations, can all have letters transferred to them in the same manner, and can be used as printing plates; but none of these will have the durability of iron.

EXPLANATION OF SOME SINGULAR EFFECTS WHICH HAPPEN TO PLAIN GLASSES, SUCH AS LOOKING-GLASSES.

(By M. de la Hire, read before the Royal Academy of Sciences, Paris, 1699.)

When we look at an object through a plain glass, that is, well polished on both sides as a looking-glass, we do not perceive that it is multiplied several times; but if it is in darkness, and the object is a luminous body as a candle, we may see it multiplied at least four times; and the multiplied object appears so much the more distinctly as the glass is more oblique to the line drawn from the eye to the object.

This repetition of the object seems sometimes on one side and sometimes on the other of the luminous body, and these appearances diminish a little in vivacity, in proportion as they are further distant; and at last they become so weak as to be no longer perceived. But there is an oblique position of the glass in which the candle does not seem multiplied; and there are some glasses through which we cannot see any multiplication of the object, though it is very much inclined.

I first observe that this appearance is sensible only when the glass, though plain, is unequal in thickness. And as looking-glasses generally have their surfaces undulated, which comes from the manner of polishing them, for they are generally well wrought and smoothed by rubbing them against one another; this shows the object

multiplied in some positions of the glass, sometimes on one side, sometimes on another, and in some positions there does not appear a sensible if any multiplication. I say, now, that the most distinct multiplication of the luminous object is made in the line which is the section or meeting of a plane, which, passing through the eye and through the object, is perpendicular to both surfaces of the glass together; and that this multiplication is made by the different reflections of the light within the glass, and by the refractions in coming in and going out of the glass.

R. W. D.

Ilfracombe.

PISTOL WHIPS—INDIA-RUBBER WHIPS.

Sir,—In your valuable Magazine of the 20th ult., among notices of recent American inventions, I perceive an announcement of a whip pistol, invented by Mr. Joshua Shaw. You will, perhaps, be surprised, when I tell you that, above a year ago, a friend of mine sent a pistol whip, of a similar construction, to me for my inspection. I then pointed out several defects, one of the most conspicuous of which was the following, which, I perceive, is also common to Joshua Shaw's, —the muzzle of the pistol was at the *butt*-end of the whip, so that if by any chance the pistol were to explode, the consequences might be serious. To obviate this objection, I suggested that the muzzle should be transferred from the butt to the thong end; and this suggestion I here beg leave to repeat. I send this, not with any hostile feeling towards Joshua Shaw—for I think it very probable that he imagined his to be quite an original invention—but merely to suggest the above improvement.

Before I conclude, I will just advert to an invention of mine in the whip way. I have just finished a whip, wholly composed of that useful article, India rubber; it is made like the common thong, only with ribands of India rubber. I expect it will prove more durable, and may be applied more *effectually*, than the common thong,

I have also made fishing-lines of India rubber web. India rubber is a good substitute for bladder in covering preserves.

Yours, &c.

E. B.

Inventor of India-rubber *coffins*.

RECENT AMERICAN PATENTS.

(Selected from the Franklin Journal for November and December, 1834.)

SELF-IGNITING CIGARS — *John Marck, New York.*—To the end of the cigar a paper *box, or receptacle,* is to be attached, containing any of the chemical compounds which ignite by friction or percussion, to to be added a piece of tinder, or ensure the ignition of the tobacco.

If care be not taken these cigar come self-smoking as well as self- for it has frequently happened to prepared matches to take fire from cidental force, when the whole rapidly consumed. As these cigar a while, be objects of curiosity, they their day, and may thus possibly purpose of the patentee; more tha do not anticipate.

IMPROVED THROTTLE VALVE *Dawley, Boston.*—This throttle val of being in the usual form of a cir operates like some slide valves, in valve and seat both consist of alte and slots, the whole of which slots or opened to an equal extent simul in the arrangement now patented, the valve seat, instead of having flat, is in the form of a hollow seg cylinder, and the valve is ground whilst it works on pins in the ce curvature. When the stem of th moved by the action of the lever o the governor, all the slots opening at once, the action of the steam is mediate, with a small degree of mo with the ordinary disk valve, and is in consequence more quickly ad retarded, and a more equal actio The claim is to "the construct throttle valve as above described, ings or slots for the purpose of a q lation of the admission of the stea boiler to the cylinder."

ACCOUNT FILE — *Samuel Arg Island.*—Two boards, each ten in and three and a half wide, are to c folded accounts between them. upper board there is a small cylin ing between two standards, to wh der the ends of a strap or belt are this strap passes through a slot m wise in the lower board. One e cylinder has a ratchet and click a it, and the other a thumb-piece fo it. The papers are to be placed b two boards, and upon turning th the strap will wind round it, and boards together, when they will b the ratchet. One end of the upper a hinge and button, allowing it to up to examine the labels, without the strap.

This little machine will undou complish the object for which structed, but it will hardly com where files are numerous, and re distant periods. The cylinder a

tenances will render it inconvenient to stow away the files upon each other; where these are few in number, however, it may be considered as a neat and useful article.

IMPROVED MODE OF TEMPERING EDGE-TOOLS—*John Glenn, Ohio.*—Although there are but few processes in the arts which do not admit of improvement, there are some which are so well understood, that the changes by which they are supposed to be improved, are received with some scepticism by those who are well acquainted with the subject. The hardening and tempering of steel is one of the processes to which we allude; for effecting these operations, several patents have been obtained, the greater number of which are utterly worthless, and we see no reason for removing this new attempt out of the general list.

The flesher, we are told, is to be plated out of solid cast steel, and tempered by being heated to a dark cherry red, and held in water until perfectly cold. The flesher, or any number of them, is then to be placed in a cast iron box, and covered with oil, tallow or other grease; this to be heated for half an hour, as hot as it will bear without blazing, and then laid out to cool.

The foregoing contains the whole process, in which there is nothing new, and which, in many cases, will not answer the intended purpose, more especially as it is to be applied to "all other edge tools," which require very different degrees of temper.

Were all cast steel alike, it would, of course, all harden at the same degree of heat, but this is far from being the case; and besides this, "a dark cherry red" will be very different by day light and in the dark, and will vary with every degree of light admitted; the bath of grease, also, is very inferior to other modes now practised for giving a uniform heat in tempering, the fusible alloys being much more perfect. As to keeping the pieces in for half an hour, this is no more necessary than to keep them there for half a day. When brought to the proper heat, the steel will be at the same temper as it will if kept at the same degree for any length of time.

WATER-PROOF BOOTS AND SHOES—*Edwin M. Chaffee, Roxbury, Massachusetts.*—"In the first place," says the patentee, "I take the India rubber leather, or India rubber cloth, and cut out the pattern of the boot or shoe in the usual form, and also the lining, which must likewise be of India rubber leather, or India rubber cloth, so that, when the outside and the lining are put together, the India *rubber surface of* both out*side and lining will come together,* and adhere, on being wet with a solution of India rubber in spirits of turpentine, and pressed together with the hands.—The seams which close the quarter and the vamp together, are made in the following manner. The lining of the quarters is cut about one-quarter of an inch longer than the outside, and the lining of the vamp is cut as much shorter, so that the lining of the quarter overlaps the joint or seam of the outside, and the joint or seam of the lining is overlapped by the outside of the vamp. In addition to this, a piece of cloth or leather three-fourths of an inch wide, and as long as the seam, which I call a stay, is cemented between the outside and the lining, and breaks the joint or seams of both. The quarters are closed together in the same manner when they are cut in two pieces, and a stiffener is cemented in between the lining and the outside, in both cases. The inner sole is then fitted to the last in the usual manner, and is then coated with the solution, or cement. The uppers are then put on the last, and the inside of the lining is then coated with the cement around the bottom edge, and as wide as it is to come in contact with the inner sole, when drawn over it, to which it is secured by merely pressing it with the hand. The bottom is again coated with the cement, as far as it is required to have the outer sole adhere, and the outer sole is then coated on the inside, and put on, and pressed with the hands till it adheres firmly. The heel is also cemented on in the same manner; but if a spring heel be wanted, it must be put on before the outer sole. After the shoe is dry, it is then trimmed off, and bound in the usual manner.

"On a late visit to Boston," says Dr. Jones, "near to which is the manufactory of these shoes, and of other articles rendered water-proof by means of India rubber, we had an opportunity of examining them in great variety. They are perfectly neat in their appearance, and we see no reason to doubt their durability; they are not, when on, and scarcely when off, distinguishable from those made in the usual way; and for ladies especially, to whom fashion has assigned a covering for the foot, which affords it but little protection against wet, they are especially desirable. But, although all ought to have them, they are not adapted to general use. Shoes made water-proof in any way, confine the perspiration of the feet, and would soon, even in cool weather, but more especially in summer, produce very unpleasant effects, as have frequently been noticed by those who have persevered in using them."

PREVENTION OF STEAM-BOILER EXPLOSIONS—Cadwallader Evans, Philadelphia.—

Those acquainted with the various devices which have been proposed, and adopted, for the provention of explosions, know that a fusible alloy, which shall melt by the temperature of the water, or steam, before it rises so high as to be dangerous, has been applied in various ways, and that in France its employment is legally enforced. As hitherto employed, it is liable to several objections, among which is the alteration which the alloy itself undergoes, by fusion in contact with atmospheric air; becoming thereby, to a certain extent, oxidized, and, consequently, having its fusing point changed. Another objection has arisen from the fusion of these disks giving a vent to the steam, through an aperture which could not be closed until the contents of the boiler had become cooled; a circumstance not only attended with delay, but sometimes pregnant with real danger, as the boat, deprived of the action of the engine, may be actually driven on shore. Both these sources of danger are guarded against by the invention of Mr. Evans, in a way which promises to be perfectly effectual, and some idea of which may be collected from the following claim:—

"I have thus described two modes in which I intend to carry my improvement in the mode of applying a fusible alloy into effect; which improvement, I do hereby declare, consists in the employment of an air-tight tube, or vessel, to contain the alloy, by which it will be preserved from oxidation, or water, for a great length of time, and in which it can be used many times in succession for indicating a certain elevation of temperature, without the necessity of renewing it; avoiding thereby the inconvenience and danger incident to the modes heretofore practised in the employment of it. I, therefore, claim the using of such alloy in the manner, or upon the principle, herein set forth, whether the same be effected by means of an instrument constructed exactly in the form described, or in any other in which a similar effect is produced by analogous means."

The alloy, when in the solid state, sustains a weighted arm, by enclosing, and holding, a piece of metal attached to the end of a journal, which passes through the box; but when the metal fuses, the weighted arm, which is on the outside of the box, descends, and, in doing so, gives notice by opening a valve for the escape of steam.

IMPROVED HORSE POWER—*Heirs of Joel Eastman.*—This is a very ingeniously contrived apparatus, the invention of a gentleman whose talent for mechanics was of no *ordinary kind. His* premature death was a *real loss to his country*, whilst those estimable moral qualities by which he was distinguished, left a void, not easily filled, in the bosoms of those who knew him intimately.

In this machine there is a stationary wheel placed horizontally on a suitable bed, or frame. This wheel has teeth on its inner rim, pointing towards its centre. The lever by which the horse is to draw crosses the upper side of this fixed wheel, and has, on its lower side, two (or three) smaller wheels, which drop within, and gear into, the teeth of the fixed wheel, and also into a pinion standing between them, on a shaft in the centre of the fixed wheel. On the lower end of this central shaft there is a crown wheel which gears into, and drives a pinion upon, a horizontal shaft, through which motion is to be given to any machinery.

The claim is to the stationary wheel, combined with the smaller wheels which gear into it, and to the pinion in the centre; "the improvement effected by which arrangement, is the advantage of bringing cogs into action on opposite sides of the journal of the pinion, by means of which the stress is taken off the journal, and two or more cogs being brought into action at the same instant, the stress is divided and distributed, thereby diminishing the liability of breaking the cogs; and, in fact, doubling the strength by this arrangement where the cogs are of the same size, and trebling it if three wheels are used. Another advantage resulting from this arrangement, is compactness and portability."

LIST OF BRITISH PATENTS, GRANTED BETWEEN THE 12TH & 22D OF JANUARY, 1835.

Andrew Smith, of Princes-street, Haymarket, engineer, for a new standing rigging for ships and vessels, and a new method of fitting and using it. Jan. 12; six months to specify.

James Stewart, George-street, Euston-square, pianoforte-maker, for improvements on the mechanism of horizontal, grand, and square pianofortes. Jan. 15; six months to specify.

Alexander Shanks, jun., flax-spinner, in Arbroath, Forfar, for certain improvements in machinery for preparing and dressing hemp and other fibrous substances. Jan. 15: six months to specify.

James Cherry, of Coventry, for certain improvements on bedsteads, or apparatus applicable for the ease and comfort of invalids and others. Jan. 15; six months to specify.

William Houston, of Fleet-street, printer, for certain improvements in type-founding. Jan. 17; six months to specify.

John Streets, the younger, lace-manufacturer, and Thomas Whiteley, mechanic, both of Nottingham; for certain improvements applicable to that class of machinery commonly called warp machinery, employed in the manufacturing of lace and other fabrics. Jan. 22; six months to specify.

John Jervis Tucker, of Trematon-hall, Cornwall, Esq., for certain improvements on urns to be used

coffee, and other purposes. Jan. 22; six
to specify.

Day of York-terrace, Peckham, for an im-
ent in the construction of railways. Jan.
months to specify.

NOTES AND NOTICES.

r-Mâché Ornaments.—It is not, we believe,
y known, that many of the architectural
nts, and even some of the members of ar-
re, both in our public and private build-
s executed in papier-mâché. This manu-
has recently been carried to an extraordi-
gree of perfection by Mr. Chas. F. Biele-
delier. All the sculptured ornaments in
rior of the Pantheon Bazaar, Oxford-street,
ig the rich cornices and entablatures, the
ind cantaliver projections, and all the alto
so-relievos, are of paper-mâché, by this
The royal arms which are to be placed over
aker's chair in the new House of Com-
—the ornaments which are to cover the
s for ventilation in the ceiling of that build-
d all the Gothic mouldings, cornices, foli-
ckets, and pendants, which are to be em-
on the walls and ceiling of the House of
are now executing by him in the same ma-
—*Architectural Magazine.*

s-boat Mortality in America.—On the 1st of
184, an official list of steam-boats on the
n Waters (Mississipi, Ohio, &c.) gives the
number of 230, whose aggregate amount of
is equal to about 39,000 tons. * * *
the period of two years from the fall of
l that of 1833, we have a list of 66 boats
it of the service; of these, 15 were aban-
ed unfit for service; 7 were lost by ice; 15
urnt; 24 snagged; and 5 destroyed by being
by other boats. Deducting the 15 boats
ned as unseaworthy, we have 51 lost by
its peculiar to the trade. In number this
lon is over 12 per cent. per annum, in
e the loss is upwards of 10 per cent.—*West-
gazine.* After such a statement, we are
prised to learn, from the same source, that
Western Waters of the United States "the
is at present is entirely overdone. Although
nefits conferred on the valley of the Missis-
s incalculable, the stock invested in boats is,
neral rule, a losing investment—in many
total sacrifice."

gth of Columns.—The effect of a straining
on vertical columns is, perhaps, the only
of the subject of the strength of materials
ch there is a marked deficiency of practical
We see every day, in the metropolis,
of immense height and weight being built,
ole fronts of which, from the first floors, are
ted entirely by iron or wooden columns;
this is done without any practical rule that
depended upon, for determining whether or
se columns are equal to the duty they have
orm.—*Mr. Barlow's Report, on the Strength
terials, to the British Association.*

n-Carriages in Dublin.—We observe, from
ublin papers, that a "Hibernian Steam-
Company" has been established, for the
g of steam-carriages on the common roads;
at one of their carriages, called the "Erin,"
e seen almost daily traversing one or other of
reets of Dublin. "The Directors," says
t's Telegraphic Dispatch of Monday last,
prudently never gave any previous notice of
route, or the hour; still the crowds are tre-
us. The Erin, on Saturday, left the station
at Clontarf with a large party of ladies and gentlemen, at one o'clock, going by Ballyhough and Annesley bridges, through Abbey-street, Sackville-street, Westmoreland-street, Grafton-street, Nassau-street, and Dawson-street, to Stephen's-green, round which it went three times, at the rate of 18 miles an hour. It then returned to the station-house in Great Brunswick-street, where having taken in a supply of water, it proceeded to Sackville-street, at the time crowded with vehicles of every description; this street it traversed repeatedly, showing the perfect control the steersman has over the vehicle: he turned a dozen times in a shorter space than any carriage drawn by horses would have ventured. After going round Mountjoy-square, and the other leading streets on the north side of the city, the carriage returned to the station at Clontarf. The total absence of horse or smoke, and the little notice taken by horses, is most extraordinary." ∞ The carriage here spoken of was built, we believe, for the Hibernian Company, by Mr. W. Hancock, who has himself gone over to Dublin to assist in the introduction of steam travelling on common roads into the sister kingdom.

Shagreen.—M. Jaugeon having been curious to know what shagreen is, which comes from Turkey, inquired of M. Feriol, ambassador at Constantinople, from whom he received all the information he desired. There is no animal of this name, as some have imagined. They make the shagreen of the skin of the buttocks of horses and mules, which is well tanned, and rendered as thin as possible; it is pressed for a certain time, and then strewed with the finest mustard-seed. When the seed takes well the skins are beautiful; if not, there remain some smooth places called *mirrours*, which are a great blemish. The finest shagreens are made at Constantinople, and in some parts of Syria."—R. W. D. *Ilfracombe.*

Floating Fire-Engines.—"In common with a multitude of spectators, while viewing the late destructive fire at Westminster, I was surprised that the (said to be) powerful floating fire-engine was not brought to bear upon the fire. Some one in the crowd told me that the tide was against its being brought from Rotherhithe: this was at half-past seven in the evening. Now, sir, I have seen, below bridge, some of the large steam-boats tow a 40-gun frigtae, against wind and tide. Surely, then, some of the smaller class, two of which, on the evening in question, were laying off Somerset-house, and three more, I believe, at Hungerford—surely some of these could have got their steam up in half an hour, and have mastered the towing of the floating-engine from Rotherhithe to Westminster. In some of the Government steam-boats a pump is fitted which, by a simple contrivance, can be immedintely attached to the paddle-shaft. If some means could be readily adopted of lifting the paddles from the surface of the water, nearly the whole power of the engines could be brought to bear upon the said pump; and if their services were not required in extinguishing the fire, by means of a long hose they could supply the engines on land."—J. T.

Competition Plans.—The undue means which are sometimes resorted to by competitors, are disgraceful in the extreme. Some have been known openly to carry about their designs for the purpose of procuring votes before the general exhibition; some unfairly attach their names to their plans (instead of using a private mark, as they ought to do), in the hope that their friends may exert undue influence in their own importance, which leads them to expect that the name alone will produce a favourable impression; and some have even been known un-

reptitionsly to withdraw their designs, in order to add improvements which have been suggested by the designs of another: nay, such is the total want of principle, and disregard of justice to the competitors, shown in some cases, that an instance could be brought forward where one of the competitors was appointed the judge! This competitor-judge most naturally gave his decision in favour of his own designs; and the unsuccessful competitors were dismissed with the most cogent and satisfactory argument, that "the judge was a man of such respectability, that he would not have chosen his own design unless he had considered it the best!"—*Architectural Magazine.*

Dr. Jones, in a letter to Professor Silliman, states, that there is a colony of gypsies in Louisiana. They were brought over by the French at an early period, have since lost their wandering habits, and now follow fixed occupations. Their complexion is darker than that of the French, and they still call themselves gypsies or Egyptians.

New Muzzle for Dogs.—The Select Council of Philadelphia have ordered that, in future, all muzzles for dogs shall be of the following description, and no other:—A substantial wire-basket, affixed so as effectually to enclose the mouth, and prevent the animal from snapping or biting, while it leaves him at liberty to drink with as much facility as if he were without a muzzle.

"*What Interest can Mr. Cort have in running down the Railway System?*"—It may suffice for an answer to this question, put to us by a correspondent, to make the following extract from a letter addressed by Mr. Cort himself, some time ago, to the *Bury Post*:—"The meeting (of the opponents of the 'Western Railway Bill') agreed unanimously that I had importantly assisted in throwing out the bill in the House of Lords; *and the Committee almost immediately presented me with a liberal contribution for my services.* The Provost and Fellows of Eton College have distributed nearly 400 copies of my pamphlets, chiefly among the members of both Houses of Parliament, *besides being liberal contributors to defray my expenses*; and nearly 4,000 copies of the work have been circulated throughout the kingdom, with 50,000 placards and statements of various descriptions, *by all the principal canal and coach establishments*, including the Grand Junction Canal, Regent's Canal, Kennet and Avon Canal, Rochdale, Mersey, and Irwell, and other navigations, also by Messrs. Shearman, Chaplin, Horne, Tagg, Grey, Pickford & Co., Deacon & Co., &c., all of whom have expressed, with equal sincerity, *their* most perfect approbation of my publications, *and contributed towards the expense.*" Mr. Cort, then, is, according to his own confession, the *paid* (if not *hireling*) agent of the gentlemen of the *coach* and *canal* interests, who are, as a *matter of course*, opposed to all railways.

An Honest Patentee—one of a numerous class.—Dr. Jones, the superintendent of the Patent-office, Washington, speaking of a patent recently taken out by a person for a contrivance for cutting out shoes, says,—"How old this contrivance may be, we cannot tell; but this we know, that the same thing was patented here twenty years ago, and again about six years since; and also that it has long been in use in Europe. The present patentee is probably not aware of this; but when the thing was patented six years since, the applicant was informed of it, and the machine exhibited to him; on being told that he could not sustain the patent, he replied, '*but I can sell rights.*'"

Weather Rules.—"I remember seeing some time ago, at the bottom of an old sheet-almanac —*as old, perhaps, as 30 or 40 years back*—a set of *verses, containing rules* for judging of the weather. I recollect only one verse of it, but for its accuracy I can vouch, from repeated observation; it is as follows:—

> 'If blue the morning sky appear,
> The day will be serene and clear;
> But if red clouds with black prevail,
> Expect a storm of rain and hail.'

"I have looked over one roll of 50 or 60 years' almanacs, in search of these verses, but without success. If any of the correspondents of the Mech. Mag. can furnish a complete copy of them, I am sure he will gratify many others besides the writer."—P., *Chelmsford.*

Mr. Bulwer's merits would not be enhanced in the estimation of the people of Southwark by the publication of the letter of his zealous but indiscreet admirer, "Glaucus." We think the "Southwark Literary Society" did very wisely in preferring Mr. Thomas to Mr. Bulwer for their president. Mr. T. is a resident of the borough of great worth and respectability, who not only founded the society, but has been one of its most liberal benefactors; while Mr. B. is only known to the people of Southwark by his literary reputation. To say the truth, it was by no means handsome in Mr. B. to allow himself to be nominated for the office, in opposition to so deserving a candidate.

Mr. Gurney's Case.—We shall next week give, in a Supplementary Number, the Report of the Committee of the late House of Commons, appointed to investigate Mr. Gurney's claims to a Parliamentary reward for his exertions to introduce steam-carriages on common roads; as also an abridgment of the accompanying Minutes of Evidence. The case is one which, independently of Mr. Gurney's personal claims, involves a great many points of much interest to the mechanical world.

We shall be glad to receive from E. B. the account of the dibbling machine to which he alludes.

We find we were in error in ascribing the invention of the *buffer*, made use of in the steam-carriages of the Dublin and Kingstown Railway to Mr. Vignoles. The inventor, and also patentee, is Mr. Bergin, the superintendent of the railway.

Communications received from Mr. Henderson —Mr. Aldersey—D. C.—R. A.

The Supplement to Vol. XXI., with a Portrait, on Steel, of the late Mr. Telford, continues on sale, Price 6*d.*; also the Volume complete, in boards, Price 8*s.*

☞ The Editor of the Mechanics' Magazine has made such arrangements as enable him to offer, on unusually advantageous terms, to undertake the solicitation of Patents for New Inventions, the drawing and revising of Specifications, and generally every other branch of Patent business. Drawings of Machines executed with accuracy and dispatch.

6, Peterborough-court, Jan. 3, 1835.

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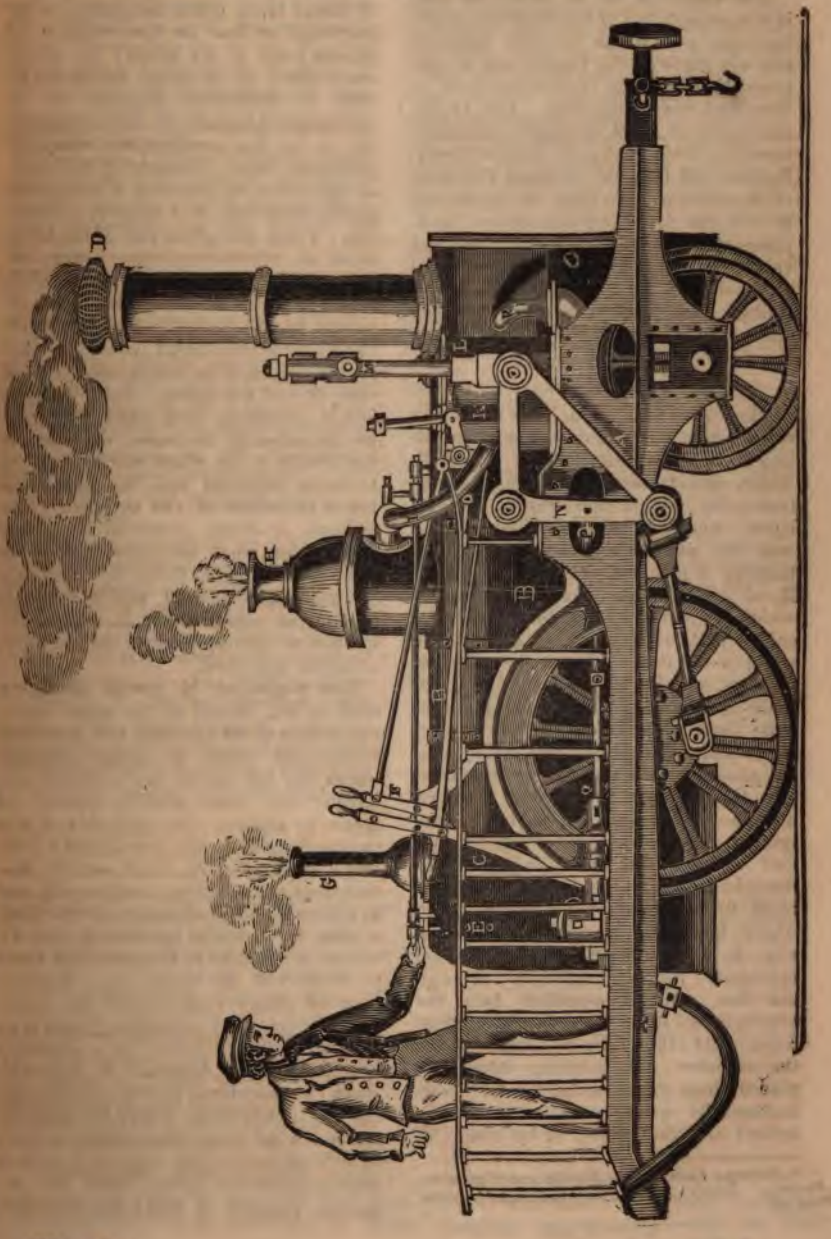

BIBLIOTECA NACIONAL HIBERNIA.

THE DUBLIN AND KINGSTOWN RAILWAY CARRIAGE HIBERNIA.

Manufactured by Messrs. Sharp, Roberts and Co., Manchester.

The engraving on the preceding page is a representation of the Hibernia steam-carriage, with which the first complete trip was made on the Dublin and Kingstown Railway, from the Station-house at Westland-row to Salt-hill. The Hibernia is one of three carriages, manufactured for this railway, by Messrs. Sharp, Roberts and Co., the eminent engineers of Manchester. We copy the engraving, as also the following descriptive particulars, from an exceedingly cheap and very handsome set of views (though but on wood) of "the Dublin and Kingstown Railway," produced from the same cheap and patriotic press as the Dublin Penny Journal.*

Description.

The frame A, on which the works are constructed, is made of strong wrought-iron; it is 15 feet long by 7 feet in width, and is supported by four springs (concealed within the frame), on an equal number of wheels, which revolve with the axle: along the centre of this framing is placed a wrought-iron boiler, B, of a cylindrical form, at one end of which is the furnace, C, from which the caloric or heat is conveyed through the water in the boiler by a number of pipes or tubes, which form the communication with the chimney placed at the other end; these tubes in the engine here represented, amount to upwards of 90, and are about an inch and a half in diameter. On the top of the chimney is placed a wire-net capping, D, to arrest the ignited particles of coke which are carried through the tubes by the rapid draught necessary to maintain the intense fire required in the furnace, and which is caused by the waste steam, after it has performed its work in the cylinders, rushing upwards through the flue, and so escaping, into the atmosphere, which it does with great force. At the furnace end, where the engineer and assistant stand, are placed three gauge cocks, E, for ascertaining the quantity of water in the boiler; also the levers, F, by means of which the motion of the machine either backward or forward, is perfectly under control, and may be almost immediately directed as occasion requires. On the boiler are placed two safety-valves; one of these, G, is under the control of the engineer, so that he can regulate the elastic force of the steam; but the second valve, H, to which he has not access, is previously adjusted for the maximum pressure or force required. He is by this arrangement effectually prevented from endangering the safety of the boiler, by exposing it to a greater elastic force than it is capable of resisting. From the upper part of the boiler, tubes or conducting-pipes convey the steam to the slide-valve box, K, which in this engine is of a peculiar form, invented by Mr. Roberts: this box is connected to the cylinders, L, which are made fast to the framing before mentioned, at each side of the boiler. The slide-valve box is a reservoir, from which the steam, by the action of the valve, regulated by the motion of the whole machine, is alternately admitted into the upper and lower chambers of the cylinder. The pressure or elastic power of the steam thus acting upon the upper and lower faces of the piston, forces it alternately upward and downward, and then passes off by the under tube, R, called the ejection or waste-pipe, into the chimney, as before described.

The piston-rod, M, passes through a stuffing-box, placed on the upper external surface of the cylinder, and is packed with oiled cotton or hemp, through which the rod moves freely without admitting the least possible portion of steam to escape. On each side of the engine-framing is also introduced a bell-crank movement, N, which receives motion from the piston by a connecting rod at one end, and gives motion to the hind wheels by a similar connecting rod, O, which is attached to the crank-pin fixed to the nave of the wheel, at a distance from its centre equal to half the stroke of the piston, and therefore causes it to revolve on the principle of a common spinning-wheel. Attached to this bell-crank movement may also be seen through the elliptic aperture, a rod, P, which is continued on to the force-pump, Q, and by a lesser stroke than the piston, with a well-proportioned pump, sends the requisite quantity of water into the boiler,

* *Thirteen Views of the Dublin and Kingstown Railway. Hardy, Dublin; Groombridge, London. Price 6d.*

to supply the place of that converted into steam; this water is drawn through a flexible tube from the tender (which is a separate machine for carrying a supply of fuel and water, and is necessarily attached to every locomotive-engine). The crank-pins on the nave of each wheel are so disposed as never to be both at their dead points at the same time, or, in other words, they are at right angles with each other.

In the tubes, I, which we before mentioned, as the conductors of the steam from the top of the boiler to the cylinder, are placed regulators, the nature of which may be easily conceived, by imagining the principle of a common water-cock; these may be turned so as entirely to cut off the communication between the cylinders and boiler, and by shutting in the steam, stop the machine altogether, or let it flow more or less as speed or occasion may require. In manufacturing engines an apparatus termed a governor, actuated by the machinery, regulates the speed of the engine; but in locomotives, the engineer has this duty to perform.

Having thus far given an outline description of the locomotive-engine, we will now endeavour to explain the ingenious principle upon which the boiler (where alone there could be any risk of explosion) is constructed, and point out how unfounded are the fears of those who apprehend such an accident. To describe it in terms familiar to every capacity, we will suppose a long barrel or cylinder of any description, closed at each end, and divided by two internal partitions into three unequal spaces. One of these spaces or chambers, between one of the partitions and the external end, may represent the furnace; the other, the opening to the flue or chimney. The space between these partitions contains the water to be converted into steam, for which purpose a number of tubes convey the heat, arising from combustion in the furnace, immediately through the water; and as the caloric liberated in the furnace by combustion has no other means of escape than through these tubes along with the rarified air, and being thus exposed to very extensive surfaces, it is transmitted with the utmost rapidity to the water. These tubes are made of thin sheet copper or brass, and are the only parts of the boiler exposed to the action of the fire, or subject to any wear; but being entirely surrounded by water on their outsides, they are effectually protected. We have seen tubes taken from locomotive-engines after having travelled 30,000 miles without being seriously worn; should, however, a fissure from expansion of the tubes by intense heat, or by any other equally unforeseen or uncontrollable cause, lead to the breaking of a tube, no other inconvenience could possibly be felt than delay, as the water and steam would immediately rush from the boiler into the furnace, and extinguish the fire; in fact, we know such an occurrence not to be uncommon on the Liverpool and Manchester Railway, and the passengers are no otherwise sensible of it than from the train ceasing to move.

THE RAILWAY CALUMNIATORS.

We subjoin a letter which we have received from Mr. Cort, on behalf of Mr. Gordon and himself, in reply to our strictures on their attacks on railways, and also some further remarks of our own upon that letter; but as our readers may be disposed at first sight to blame us for admitting such a composition into our pages, we must explain, in a few words, why we do so. We beg, then, to assure them, that we do not insert this letter from any feeling that the writer himself has the smallest claim, either in courtesy or justice, to the use of our columns, to reply *in the way* he has here done. We insert it, for these reasons solely:—first, that if it be true, as Mr. Cort avers, that he is, in this matter, the paid instrument of the "principal canal and coach establishments" throughout the country, the letter, and our remarks upon it, may serve to convince the very respectable gentlemen who are at the head of these establishments, that they are throwing away their money upon a gross deceiver; second, *because the calumnies of Mr.* Cort—so industriously have they been circulated *(by means of no less than* "50,000 placards and statements of various descriptions")—*so pertinaciously* reiterated at every possible opportunity—and so little

checked (hitherto) by the correcting hand of the press, that, absurd and grou as they are, they have *done harm*—harm to the railway system in popular estim and harm even to the gentlemen of the canal and coach interests, who err grea supposing that any thing that would increase the general traffic of the country injure them; and because we can imagine nothing so well calculated, as the which follows, to put an end to the career of Mr. Cort and his "Imposition Ed. M. M.

MR. CORT'S LETTER.

Sir,—In No. 597 of the Mechanics' Magazine, under the head of "Gordon on Locomotion," you allude to a "Book of Calumnies, published some time ago by a person of the name of Cort, for the purpose of bringing railways into disrepute." A work, you say, "of some cleverness, but shamefully deficient in veracity and candour;" and further, that "the Directors of the Manchester and Liverpool Railway had been at some pains to publish an official refutation of the charge brought against them by Cort"—that charge being nothing more nor less than having deceived all Europe by paying dividends out of *borrowed* capital.

Now, sir, before you attempted to impugn the veracity and candour of my publication, entitled, "Railroad Impositions Detected"—to throw discredit on my character—and use my name in the vulgar and ungentlemanly manner that you have done—to please, perhaps, your employers—it would have been more judicious for yourself, as well as more just to me, had you as a journalist, aspiring to direct the public mind on the great question of mechanical conveyance throughout the kingdom, taken, at least, the pains of examining into the grounds for such detraction, before you committed yourself.

REMARKS.

Mr. Cort takes two things for granted, in his s paragraph, which he has no warrant or pretext ing:—The first is, that there are certain "empl whom we have made it our business "to p in speaking of his "Book of Calumnies;" cond, that we condemned the book without at "the pains of examining it." Both impu are equally groundless. "Employers" we none; we spoke of his book as our own s justice dictated, influenced by no one, and for no interests save those of truth. Neith we condemn without examination. We di mine his book, and with all possible care, "l we "attempted to impugn the veracity an dour" of the author, or to "throw discredit character;" and, since the fairness of the ment we passed upon it has been called in qu we have examined it a second time; but th we see and think of it, we are only the mo more satisfied that a less veracious, less c and less creditable production has rarely from the press. We give this as our deli our conscientious, and, we rather incline to unalterable opinion. Mr. Cort quarrels wi style of speaking of him, as "vulgar and un manly." If we had said flatly that he li that he *could* lie, through a nine-inch plank sailors say), there might have been some for so characterising our manner of speech all that we thought it necessary to do, was a deficiency "in veracity and candour." I gentler phrase could we describe the mark branded on his forehead? Mr. Cort is, of al the last who should complain of hard words "Book of Calumnies" is a perfect Billingsga Its very title is a volume of slander. "R *Impositions* Detected"! The authors of alleged *impositions*—the *impostors*—being as high standing for honour and integrity as the country. In another publication of Mr. (*Circular Letter to the Nobility, Gentry, owners, Canal and Navigation Proprietors Dec.* 1834), he denounces "every man wh forward publicly to uphold the present princ railway communications," as "*stultifying a gracing himself in the eyes of the whole nat* as lending himself to a system "*by which the* community is to be juggled"—as guilty of "a "*a thousand times more penal than the ac*

LETTER.

But I trust that you will make the *amende honourable* in your own pages, so that the public may see how the case stands between us, without compelling me to give them this information through other channels, which would warrant the inference that you have wilfully charged an individual with "want of veracity and candour," and done your best to injure his character, whilst you have neither the honour nor the honesty to make the reparation as public as the attack.

In reply to your assertion touching the "official refutation"—or denial (for it was no refutation), published by the Directors of the Liverpool and Manchester Railway, you ought to have been aware that such denial was published at least *fifteen months before I had written a word on the subject*, as that denial referred to statements printed and circulated *by Mr. Thos. Grahame nearly*

REMARKS.

MOST ATROCIOUS DECEIVER." What ought a person who indulges in such vituperative language towards others to expect, in reason for himself? What, but that those whom he arraigns as public cheats and impostors should give him the lie in his teeth?

Neither "honour" nor "honesty" call upon us to make reparation where none is due. We charged Mr. C., not only "wilfully" but advisedly, with being "deficient in veracity and candour," and we abide by the charge.

We presume we may trust Mr. Cort so far as to believe what he here states with respect to the time of the official publication alluded to, and that of his own appearance on the stage. Taking, then, the dates to be as he represents, we are bound to confess that we were in error in stating that the Directors of the Liverpool and Manchester Railway had "been at the pains to publish an official refutation of the charges brought against them by Cort." The Directors, it now appears, have never condescended to notice Mr. Cort at all. But, though the party refuted was different, the charge was the same. So much Mr. Cort will not, probably, deny; but, lest

LETTER.

three years ago; which led to the detection of those other railway impositions since made so notorious by myself; and which I challenge you, or any other individual meaning to stand honest with the public, to refute.

REMARKS.

he should, we shall here give the official re itself. It is dated 23d Jan., 1833, and is words:—"It has been asserted, and repea so much apparent confidence, that indiffer sons *might* imagine there was some found the statement, that the dividends of the C have been paid not from the *profits* but f *capital* of the concern. Though aware t slander has been hazarded on occasion of of the declared dividends, the Directors hav to considered the imputation unworthy of nor would they now have deemed it nece reply to so absurd an insinuation, if they understood that in distant parts of the where the establishment of railways is at under discussion, and where the example Liverpool and Manchester is naturally ref by the advocates of similar undertakings, have hesitated in giving their support to posed schemes, on the ground alluded to; peared to expect from the managers of this a formal declaration on the subject. Th leave, therefore, to state distinctly, that the c paying dividends out of capital is *altogether less.* The total amount of capital stock, from the commencement to the 31st Decem whether in shares or by loan, is 1,024,375 *farthing of which has been expended on the* Mr. Cort calls this "a denial" merely, a refutation;" but to our minds it presents plete and triumphant a refutation as the stances of the case could possibly admit o charge brought against the Directors ing to Mr. Cort's latest edition of it—C *Dec.* 1834), is that their large dividends been paid not out of *bona fide* profits, but out rowed money," and the answer which they it is, that "the total amount of capita created from the commencement to the Dec., (1832), whether in shares or *by* 1,024,375*l. every farthing of which has l pended on the works.*" What is there in the which this answer does not distinctly meet? doubt which it does not completely resolve? shilling of the Company's capital—wheth scribed or borrowed, is a matter of no conse —is shown to have been so employed, tha the dividends from any other source than " was literally impossible.

The reader will please to take particula that, according to Mr. Cort's own confess charge which he now brings against the Liver Manchester railway—which he is every da ing, in some shape or other, on the public a —by pamphlet, by placard, by advertisemen private circular—*the same charge identicall* made by another person, (Mr. Thos. Graham

LETTER.

REMARKS.

REFUTED, "*fifteen months before he* (Cort) *had written a word on the subject.*" Mr. Coft must have known then, from the first, that he was doing the Company an injustice. He was not betrayed into error by any false process of reasoning—as the most honest men sometimes are—but erred wilfully and deliberately. He took up what he knew to be an exploded scandal, and repeated it with as much apparent sincerity and confidence as if it were fresh from his own brain, and had the fullest sanction of an approving conscience. He stands in precisely the same predicament which we have said Mr. Gordon stands in (p. 265), namely, that of having "not only repeated a gross untruth respecting a matter of great public interest and importance, but of repeating it *with a perfect knowledge of its being so.*"

Mr. Cort and Mr. Gordon may, perhaps, tell us that they do not admit there was any "untruth" in what they repeated—that they do not consider the defence made by the Company to be good for any thing. No doubt they will say so; but we are confident all impartial men will agree with us, in taking it to be a sure sign of their *thinking* otherwise (whatever they may *say*), that in the latest writings of *both* these gentlemen, they have chosen to give the *charge* against the Company, *but not one word of their defence.* No person can be in any doubt as to the motives of such a suppression as this. It must—it could only have proceeded from a conviction, that to publish the defence would have been to destroy every pretence for the repetition of the charge.

We might perhaps be disposed to waive the inference so fairly deducible from their suppression of the Company's defence, if now, that they are forced (by us) to speak to it, they could give a single plausible reason for ever questioning its validity. But this we defy them to do. Mr. Cort shall presently bear us witness, that the thing is not to be attempted without the most miserable failure.

With regard to your observation, that Mr. Gordon was one time accused of having ritten my book, and that he d publicly, and somewhat dignantly, disclaimed the thorship of it, I take this opportunity of saying, that however much Mr. Gordon may ve been indebted to others, d myself among the number, r the information which is ven in his work, I am indebted to no one for the facts d arguments which I have blished, but to my own in*uiry and research; and how-*

What! not even to Mr. Thomas Grahame, whose statements, so similar to Mr. Cort's, existed "fifteen months before he (Cort) had written a word on the subject."?

LETTER.

ever valueless such exertions may be in your judgment, or in that of others who trade in the pockets of the community by railway delusions, the "Book of Calumnies," at one public meeting, elicited from Mr. James Walker, probably the most experienced and talented railway engineer in Great Britain, the following declaration,—"I must confess there is a great deal of TRUTH in Mr. Cort's statements:" and many of the principal merchants at Cambridge have also expressed quite as publicly a similar conviction; while, at another meeting, a special vote of thanks was recorded for "the valuable information which it had promulgated, and the misrepresentations which it has exposed," the effect of which has been to open the eyes of the country at large to the evils of the railway system, whilst it has organised that co-operation, which, during the next Session of Parliament, will try whether your opinion or my own on this subject is the heaviest.

I might here terminate my letter, having fully replied to the charges brought against myself. But as you question the accuracy of the deductions made by Mr. Gordon, from the figures he has taken from my *book, I am quite willing to relieve that gentleman* from the

REMARKS.

Mr. Walker is certainly most respectable authority; but what does his testimony amount to? That "there is a great deal of truth in Mr. Cort's statements." No doubt there is "a great deal of truth in them;" but how much also of falsehood? Mr. Walker does not say there is none; the words ascribed to him rather imply the reverse. It would have been strange indeed—something even beyond Mr. Cort's powers—if he had made up his book of falsehoods entirely. Besides, it is any thing but clear that it was the statements in Mr. Cort's BOOK to which Mr. Walker referred. He is said to have made the observation ascribed to him at a "public meeting." What meeting was that? Was it not one held at Cambridge to consider of a scheme of a Grand Northern Railway, by a certain grand speculator in railways, north, south, west, and east, of the name of Cundy? And were not "the statements," to which Mr. Walker alluded, statements referring exclusively to that "Grand Northern" scheme? We are almost certain that this was the case. Mr. Walker, though not perhaps "the most experienced and talented *railway* engineer in Great Britain," has too high a character, both as a man of science and a gentleman, to permit us to suppose that he can have, by any opinion of his, helped to give currency to such a "Book of Calumnies" as Mr. Cort's.

With respect to the public meeting which voted its thanks to Mr. Cort, we shall be prepared to estimate the value of that vote, when we are informed how the meeting was constituted, and how conducted. If composed principally of the *cads* of the "canal and coach establishments," in whose pay Mr. Cort declares himself to be, which is very likely; and if conducted on the Cort and Gordon system, of hearing one side only, which is still likelier, Mr. Cort is extremely welcome to all the weight which the approbation of such an assembly can add to his character.

"Fully replied"! Mr. Cort should have said—"as fully *as I am able.*"—for his full reply is, in fact, no reply at all.

Since it was Mr. Cort's figures that got Mr. Gordon into his present scrape, it is no more than fair that Mr. Cort should do his best to get him out of it. Let us not, however, be led by Mr. Cort's affected gallantry, to mistake the real state of

LETTER.

difficulty he may experience in defending such deductions, and in enabling yourself to understand them.

The subjoined* presents a comparative view of the traffic, expenditure, income, and profits, on the Manchester and Liverpool Railway, for the years 1831 and 1833. From this it will be seen, that if the passengers fares are charged the same in 1833 as they were in 1831, the railway was compelled, in 1833, by the competition of three water lines, (though the latter are nearly double the distance, and for 18 miles exposed to the winds and tides of the Mersey) to carry 153,088 tons of goods and passengers, requiring, according to the estimates of Messrs Walker and Rastrick, more than 340,000 tons of dead weight in machinery, engines, waggons, fuel, water, attendance, &c., making together nearly 500,000 tons of actual *wear and tear weight*, at an additional cost of 24,845*l.* to obtain what is worse than nothing—a loss of 6,704*l.*, as compared with 1831.

Besides, Mr. Booth, the treasurer, confesses, in the report made by himself to the Directors, on the causes which have led to the failure of the best railway in the world (see Edinburgh Review for Oct. 1834), that "the object hitherto has been rather to lay the foundation of a beneficial intercourse in future, than with a view to any IMMEDIATE PROFIT."

REMARKS.

matters. The "deductions" are not, as he pretends, "deductions made by Mr. Gordon," but deductions made by himself; both figures and deductions are of his own coinage—except in so far as they may have been borrowed from his "fifteen months'" predecessor, Mr. Grahame.

Well, how does this "comparative view" of "the years 1831 and 1833" prove that the Company's dividends "have been paid, not out of *bona fide* profits, but out of *borrowed* money"—the great, indeed the only, point which (as far as we are concerned) Mr. Gordon and Mr. Cort were called upon to substantiate? It no more proves that, than it proves that there are granite ways in the moon. It shows (supposing Mr. Cort's figures to be correct) that the *profits* in 1833 were 6,704*l.* less than in 1831. But what then? There was still profit enough left out of which to pay all the dividends, and no need whatever of borrowing money for the purpose.

Mr. Booth never made any report on "the causes which have led to the *failure*" of the Liverpool and Manchester Railway; or any report which assumed such "a failure" to have taken place—Mr. Booth never made use of the words ascribed to him in the sense in which they are here quoted against him—and the article in the Edinburgh Review, which is referred to, as describing the Liverpool and Manchester Railway to be "the best in the world," contains nothing of the kind. The report to which Mr. Cort here alludes, was a report by Mr. Booth on the cost of the locomotive power of the railway, and the practicability of diminishing it; not one word about "failure." In the course

*

	Passengers. No.	Fares, each. s. d.	Total payable weight including passengers. Tons.	Total Expenditure. £	Total Income. £	Total Profit. £
1831	445,047	4 7¼	147,280	84,405	155,501 ..	71,097
1833	386,492	5 1¼	300,368	109,250	173,643* ..	64,398
	58,555	1 6	153,088	24,845	18,142	6,704

Total Income..... £193,305
Deduct fo increased fares, 386,492 passengers, at 6d each.... 9,662

£183,643*

LETTER.

REMARKS.

of this report, Mr. Booth observes, that "in order to accomplish the transport of *goods* from the branches and from intermediate places, engines are dispatched several times a day, from both ends of the line, to clear the road; *the object of this arrangement being rather to lay the foundation of a beneficial intercourse in future, than with a view to any immediate profit.*" Seizing hold of the last clause of this passage, but changing the commencing words—"the object of *this* arrangement," into "the object hitherto has been,"—and so falsifying, by generalising the application of the words, which referred to the transportation of goods alone—Mr. Cort triumphantly exhibits it as a *confession*, by the treasurer of the Company himself (in the teeth of his own accounts, and in the teeth of the large dividends paid to the shareholders!) that they have never as yet made any "immediate profit" worth talking of, and set all their hopes of advantage on the future. Talk of "veracity and candour," after this! We never, in all our experience, met with an instance of falsification so deliberate and audacious.

But even this assurance on the part of the Treasurer himself may not be enough, unless I satisfy you also as to the dividends being paid out of borrowed money, which may be simply shown by striking the balance between the whole expenditure and receipts, from the opening of the Railway in September, 1830, to the 30th June, 1834, in two forms, with and without dividends, as under.*

To talk of the NET PROFITS of such a speculation, laden as the Treasurer's accounts testify, with loans and liabilities, with or without divi-

The trickery by which Mr. Cort here makes it out to be "an insult to the understanding," to talk of the Liverpool and Manchester Railway yielding a profit, consists simply in making one of the items on the credit side of the account, about one-fourth less than it should be. The amount of the capital invested in the concern, is entered on the side of "Expenditure," under the head of "Ways and Works, finished and unfinished," and is *there* stated to be 1,132,075*l.*; but instead of entering the same sum on the opposite side of the account, as he ought clearly to have done, he gives credit for so much only as consists of "Capital subscribed;" that is, of capital raised in shares,—namely, 796,875*l.*; and thus it is he contrives to obtain his balance of 350,000*l.* against the Company. You have but to insert, however, *the same sum* for capital on both sides of the account, and the whole fabric of

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* WITH DIVIDENDS.

Expenditure.		*Receipts.*	
Ways and Works finished and unfinished	£1,132,075	Capital Subscribed	£796,875
Current Outgoings	348,685	Railway traffic	603,635
Dividends and Reserved Fund	254,949*	Balance	335,199
Total	£1,735,709		£1,735,709

* The whole sum due for interest to the shareholders, including amount lost during construction up to July, 1834, is 251,905. See page 45, No. 1, "Railroad Impositions Detected."

WITHOUT DIVIDENDS.

Expenditure.		*Receipts.*	
Ways and Works finished and unfinished	£1,132,075	Capital Subscribed	£796,875
Current Outgoings	348,685	Railway traffic	603,635
		Balance	80,250
Total	£1,480,760		£1,480,760

LETTER.

dends—in the former case exceeding 335,000*l.*, and in the latter 80,000*l.*, exclusive of 251,905*l.* due for interest, and this too after a trial of three years nine months and a half —is no better than an insult to the understanding of any man who knows great A from little b.

Yet, Mr. Editor, in excuse for this nefarious system which threatens to annihilate the prosperity of such a multitude of interests, you are induced to assert, that it was deemed expedient to construct a Tunnel under Liverpool; and though the Directors have borrowed money with one hand and paid dividends with the other, still, it is wise on their part to contract for loans at 3 and 4 per Cent., to make a profit of 8 or 9 per Cent. But with regard to the Tunnel, there could be no honest excuse for borrowing three times more than the original estimate for its execution, much less to contract liabilities of one kind or other, *equal, at this moment, to the*

REMARKS.

his jugglery is at once dissolved. According to Mr. Cort's mode of stating the matter, that only is to be considered as money received, or capital, which was subscribed by shareholders. But was not the money raised by loans, equally money received? And since it was expended on the works, was it not equally capital invested in them? What the public want to know, (for the sake of guidance in similar undertakings), is whether the Liverpool and Manchester Railway really affords those handsome returns which it is represented to do; and to come at the truth on this head, all that is necessary to be ascertained is, first, *the total amount* of the capital invested in it,—not *by whom* it was supplied;—and, second, the amount of the annual revenue—not *among whom* it is divided. Even though *the whole* money had been raised by loan, instead of part only, that would not have altered the general result one jot. We mean according to every just and rational view of the case; for according to Mr. Cort, had the whole of the money been borrowed, he would have had nothing at all to insert in his column of receipts, under the head of "Capital," and his fanciful "balance of 335,199*l.*" would have been raised to 1,132,074*l.*!!!

All this is so absurd, that we do not imagine we can be doing any injustice to Mr. Cort—for he is no fool (whatever else),—in concluding that he has been all along deliberately practising on the public credulity, trying how far a well-mouthed story of imposture, supported by an imposing array of figures, and repeated again and again till familiar to the popular ear, might in the end come to pass for truth.

All this is only a repetition, with embellishments, of the egregious absurdity we have just exposed;

LETTER.

full amount of the original estimate for the whole line, because the funds requisite might have been supplied by the Tunnel alone, out of the daily income, and the difference only, if any, borrowed; such, at least, would have been the conduct of men not wishing to bolster up, or to advocate, knowingly, the safety of rotten securities. I fear, however, that while the Tunnel has been made the ostensible ground for borrowing money, the *real* one has been, and still is, to prevent the shares from tumbling to an alarming DISCOUNT, by paying dividends; that the share market might not see that all the resources of the Railway were swallowed up in the cost of works, not even contemplated, much less included, in any one of the numerous Estimates before the Railway opened, and that, consequently, a dividend of one farthing per Cent. was quite impossible.

These remarks, coupled with the figures I have given you, will, to quote your own words, relieve Mr. Gordon from the "not very enviable predicament of having not only repeated a gross untruth respecting a matter of great public interest and importance, but of repeating it, *with a perfect knowledge of its being so.*" But it will, at the same time, put yourself into a much greater predicament, by requiring you to disprove my statements, or publicly confess that you have done me much injustice, "respecting a matter of great public importance," though I will not do you the injustice to add, that you did it "with a perfect knowledge of its being so," because, as far as I am able to judge from the columns of your magazine, it appears to me, that you *have a very imperfect* know-

REMARKS.

but out of his own mouth we will again confound the slanderer. He says, "the funds requisite might have been supplied for the Tunnel *out of the daily income*, and the difference only, if any, borrowed." "*Out of the daily income?*" Pray mark that reader. "Out of the daily income" of a concern, which, according to the writer, yields no income—no profit—not even as much as could pay "a dividend of one farthing." Certainly the capital requisite for the execution of the Tunnel, *might* have been supplied out of the daily income; but as it was not so supplied, but raised by loans, the daily income—minus the interest payable on these loans, has remained to be divided among the shareholders.

We humbly submit that we *have disproved* quite enough of Mr. Cort's "Statements," to make it extremely superfluous, that we should "publicly confess" that we have done him any "injustice;" our only fear is, that we have not done him justice enough. We doubt not we have yet much to learn before we shall be able to boast of a *perfect* "knowledge of the Railway Question," but we are thankful that we already know sufficient of "the Railway-train," to be able to tell as well our neighbours, when a person (to use an American phrase) "has burst his boiler."

LETTER.

ledge of the Railway question.

R. CORT.

No. 9, New North-street,
Red Lion-square, Jan. 24, 1835.

P. S. In my fifth number, now in the press, you will find evidence proving incontrovertibly, that the *Stockton and Darlington* Railway, is equally conspicuous for the payment of dividends out of borrowed capital.

Additional Postscript, January 24.

I open this to thank you for the additional favor conferred upon me, which I have just noticed in this day's magazine, No. 598, to which the following may serve as my reply:—

What interest has the Editor of the Mechanics' Magazine, Engineers, Solicitors, Secretaries, cum multis aliis, in supporting and advocating the Railway System, which I have proved to be a notorious cheat? Answer. — The money each will get by bolstering up rotten securities for pecuniary investment. When the sagacious, but cunning Editor, will point out a single individual in his senses, who will voluntarily incur heavy expenses for the public good, and not permit those who benefit most by his exertions to share their expenses, then the undersigned will say more on the subject.

R. CORT.

REMARKS.

"Evidence," we will make bold to say of precisely the same weight as that by which you have proved "*so* uncontrovertibly" the same thing of the Liverpool and Manchester Railway. We may here remark, that though we have confined our refutation of Mr. Cort's charges to those which concern the Liverpool and Manchester Railway alone, it is not because his charges against other railways, (with one or two exceptions), are any better supported, but simply because we subscribe unreservedly to the ancient maxim, *Falsum in uno, falsum in omnibus.*

After what has been said, we may not dispute that this discussion *has* brought to light a most "*notorious cheat*;" but that Mr. Cort has placed the cap on the right head, we must take leave very submissively to doubt. The public will perhaps decide between us; and to their decision, whatever it may be, we shall cheerfully bow.

MR. HALL'S STEAM-ENGINE IMPROVEMENTS.—MR. WM. BRAITHWAITE IN REPLY TO MR. ROSSER.

Dear Sir,—In the absence of my brother, Mr. John Braithwaite, who is at present on the Continent, I trust I shall be excused for making a few remarks on the letter of Mr. Archd. Rosser, which appears in your journal of the 17th inst., touching Mr. Hall's alleged Steam-Engine Improvements.

Mr. Rosser states, "I lament to observe that no sooner does any thing in the way of improvement make its appearance, than SPECULATORS will immediately enter *fishing caveats* (if I may be allowed the expression), in periodical works against it. *You, as a man versed in patent practice, will very well know what I mean*"—thus appealing to you to corroborate his assertion.

Now, Sir, I beg to appeal to you in my turn, and to ask whether the insinuation, which this passage contains against Mr. John Braithwaite, can be borne out by any thing which he has ever said or done on this or any other occasion?* Did not my brother state expressly in the letter to which Mr. Rosser's is intended, I presume, as a reply—that he would not have obtruded himself on the public attention (averse as he is at all times from every thing in the shape of controversy), but that his "name had been improperly made use of, to countenance the exaggerated statements which Mr. Hall had put forth, of the advantages obtained from his apparatus?" And is not Mr. Rosser, also, well aware that my brother's name was not so improperly made use of, till *after* Mr. Hall had applied to him to take out a licence under his patent, and had *refused*, on the ground that there was nothing new in it? How then, can he, with any reason be deemed a "speculator," as regards Mr. Hall and his patent? And above all, a "*fishing* speculator?" What, in the name of wonder, was there to fish for? A patent not worth a straw!

Mr. Rosser next gives us to understand that he has advised Mr. Hall to say nothing in reply to my brother, but to leave him to his legal remedy, when he promises on Mr. Hall's part to do great things. A very *lawyer-like* advice, this certainly; very *proper* advice too, perhaps, under all the circumstances; but it puts me forcibly in mind of what a late worthy Chief Magistrate used to say whenever he heard advice of this sort given to an accused person,—"If you know that you are guilty, follow your lawyer's advice by all means; but if you are conscious that you are innocent, you will take mine, and exculpate yourself as fast as you can."

It is of importance to keep in mind what the charge is which Mr. Rosser advises Mr. Hall *not* to answer. It is simply this, that he has published a letter from Capt. Martin (thereby sanctioning it), in which an untrue account is given of the results of the trial made of Mr. Hall's apparatus on board the "City of London" steamer, and expressions confirmatory of that untrue account, are ascribed to my brother, which my brother positively denies having ever used.

What man, "conscious of innocence," would think of waiting the course of law to make answer to such a charge as this?

And who can be in error as to the conclusion that ought to be drawn from silence under such circumstances?

With regard to Mr. Rosser's *refresher* about a vacuum of fourteen inches, I can only say, it is not at all unlikely that my brother may have *in this instance* said what is ascribed to him. I am myself aware of an experiment, in which, in a condenser *(on the principle in question)* of a fifty-horse engine, a vacuum of 14 inches was constantly kept up with a single acting air-pump, of *only* six inches diameter, and one foot stroke, making the same number of strokes with the engine. As Mr. Rosser, however, disclaims any knowledge of engineering, I cannot expect that he should be able to appreciate the bearing which this fact has on the merits of his client's defective apparatus. I therefore forbear to enlarge upon it; and beg, in conclusion, to subscribe myself,

Dear, Sir,

Yours, very truly,

WM. BRAITHWAITE.

Bath-place, January 28, 1835.

* *Thus appealed to, we must own that we do not think it can; we consider the imputation to have been altogether uncalled for.*—ED. M. M.

OF THE SELECT COMMITTEE OF THE HOUSE OF COMMONS ON MR. GOLDSWORTHY GURNEY'S CASE—WITH THE MINUTES OF EVIDENCE (ABRIDGED).

REPORT.

r Committee are only prepared, at the present late period of the Session, to ıe Minutes of the Evidence taken before them; but they earnestly recom- ıt the inquiry may be resumed early in the next Session."—July 17, 1834.

MINUTES OF EVIDENCE.

ldsworthy Gurney examined—From 831, has exclusively devoted him- omotion. His attention was first the subject when he was a boy. a visit to Mr. Vivian's, of Cam- ımmonly known by the name of ındrew Vivian. He went to school Vivian's son, and spending his holi- Camborne, there saw Mr. Treve- ıt experiment with a view to draw- ıges by steam; he (Mr. Treve- d an idea that it was practicable, that view built a carriage for the he tried it on the common road, not make it start on the level; he ı it to a declevity with a view of to move; the carriage went down ı gravitation, and got into a hollow tom, towards Lord Dunstanville's, Camborne. When at the bottom ll, he attempted to start the car- n; the wheels went round upon the ıut the carriage did not advance. made a strong impression on and he never forgot it in after ıme to London in 1821, and ıinted Chemical Lecturer at the ıstitution; where, during certain ıts upon heat, he found that some ıceived notions respecting steam ırrect,— that in particular, the surface laid down as necessary , to generate steam for a certain s over-rated, and that the degree ation depended more on the nature ıe extent of surface. It appeared hat if a certain state of surface ıroduced, and a certain state of in- fire at the same time preserved, a powerful boiler might be obtained, ght be applied to locomotion with ıomy and national advantage upon ı road. It was found that heating assed free heat through them, with in an inverse proportion to the ; at the same time it was observed, ıtensity with which heat was given ombustion, was in some rate or ı to the quantity of oxygen im- *it in a given time.* These two facts enabled witness to construct a generator with a much smaller surface than those previously used, and consequently much lighter. The difficulty remained to form an apparatus, in which advantage might be taken of these facts. Witness consulted several engineers and eminent men of the day on the subject, who all stated that the insurmountable difficulty of propelling carriages on common roads, consiated not in the engine, but in the means of applying it to the road. Being asked to name the engineers he consulted, mentions Sir Humphrey Davy, who, although not an engineer, was supposed to know what had been done in most subjects of mechanical science; and Mr. Moyle, a celebrated engineer in Cornwall, who had made experiments on the subject of steam locomotion after Trevethick. In consequence of the opinions given by these gentlemen, and the strong impression left on witness's mind, by the fact which he witnessed when at school, of the wheels of Trevethick's carriage going round without moving the carriage, he did not feel it worth while to make a single experiment, but took it for granted that it was true. He took out a patent in May, 1825, for propelling carriages along common roads; in which patent, feet were proposed to be used. He afterwards found from experiment, that the phenomenon of the wheels going round in all cases in which it had been observed was a matter of accident; a peculiarity arising from the manner of letting the steam to the engine, and that the wheel was sufficient, not only to propel the weight resting upon it, but also six times the weight that did rest upon it, when properly managed. It was generally believed that friction was not sufficient, and this opinion was received, not only in this country, but in others, which are said to have better mathematicians amongst them. Witness believed so on account of having actually seen the fact at Mr. Trevethick's experiment. Mr. Moyle stated that he had made an experiment in Cornwall upon propelling carriages, by pushing out poles at an angle of 45 degrees behind the carriage, and by that means thrusting it along; so convinced was he from what he

had seen and heard, (of the insufficiency of wheels alone). Tried several experiments to overcome the supposed difficulty, and has heard of many. At one time he used a revolving chain, which carried the rollers with it; they passed under the carriage to the ground, by which the carriage was propelled. These rollers were armed with projections, so that as they revolved under the carriage, they became stationary upon the ground; the engine acted on them, and propelled along; somewhat analogous to the ordinary method of rolling or launching a boat. Found by experiment that there was sufficient friction between the ground and the wheel of the carriage. In a very scientific publication, it was stated to be "somewhat singular that a person of Mr. Gurney's quickness should have that opinion." But as he saw the fact when a boy, and had it confirmed by the authority of engineers and practical men, it is not to be so much wondered that he believed it; knowing at the time enough of experiment to feel that the best theories are often upset when carried into practice. It was about three or four months after he had taken out his patent, he found the notion of want of sufficient adhesion was an error. The steam, in ordinary stationary engines, is thrown full upon the cylinder by large openings, and by that means it acts suddenly upon the piston of the engine: this, by the laws of percussion, strikes or starts the wheel round before sufficient bite is obtained to move the carriage; but if the steam is slowly let on, then sufficient hold is obtained, and the carriage will advance. It is evident, that the fact of Mr. Trevethick's wheel going round, arose from the steam being turned on in the ordinary or usual way then used in working steam-engines; for it may be stated, that although the carriage was so heavy as not to be of any practical value, being nearly a ton weight to the horse power, yet still by decomposing time into power, either by means of the plane, the lever, or any mechanical mode of that description, he might have moved it on the road, although he could not have obtained much speed. After discovering that there was sufficient friction, witness took out another patent. That was also in the year 1825. The first experiment he made with a steam-carriage on a common road, was with a model at Kilburn, in May, 1825; the model, with the propellers, ascended the hill that was then not cut down, at the turnpike-gate at Kilburn. He built a full-sized carriage in 1825, which ascended Windmill-hill, near Edgeware; and in the ascent of this hill, he first discovered that *the propellers did not* come into use. Refers *the Committee* to witness's evidence before the Committee of the House of Commons on Steam Carriages, in 1831,* in which these experiments are fully related. His attention was then directed to the wheels, with a view of producing a better and more effectual locomotive-carriage. A continuation of these experiments went on favourably from point to point towards perfection. In 1826 the success of witness's experiments induced him to set up a manufactory in Oxford-street, in which he built the large, full-sized carriage before-mentioned; but after trying the experiment at Kilburn, and discovering the error in regard to the wheels, having taken out a patent for a new boiler, and seeing that he had overcome the chief difficulty in regard to weight, he moved into very large premises in the Regent's Park. He was confident of the great value of his patent, and quite satisfied as to the ulterior result of the subject,—having at the same time obtained such data as he conceived to be decisive upon the subject, respecting weight, and the comparative expense of moving steam-carriages in comparison with horse power, the injury upon roads, and other important points. In these premises the experiments went on for some time, principally with a view of applying the various apparatus in the best possible way to working the wheels, which were now discovered to be effectual; at last witness overcame most of the practical difficulties, and went up the old Highgate Hill as a trial and proof of certain points. This was about April or May, 1826, when the opinion was very general that carriages could not move at all on common roads, and every one believed that they could not move up hill. The fact, however, being proved by this experiment, induced parties who were acquainted with it, to purchase a sixth part of the patent for 5000*l*. The great difficulty was that of getting a sufficiently small and light boiler, or surface to supply a sufficient quantity of steam. The most simple form was that of tubes. Tubes had been tried before for raising steam, but had invariably failed, in consequence of the steam formed in the tubes driving out the water as it escaped. Witness made a series of experiments to endeavour to overcome that difficulty; that is, to ascertain the peculiar changes which take place in water under a certain increase of temperature, increase of pressure, formation of steam, and the compressing of it; and also when escaping from the vessel. The result of these experiments was, first, the observation that there was a circulation in the vessel in virtue of the change of specific gravity occasioned by the heat passing to the

* See Mech. Mag. vol. xvi. pp. 395, 412, 428.

fluid in a rapidity proportioned to the intensity of heat. Means by circulation, that the particles of water which are in contact with the heated surface, become specifically lighter and ascend; they are succeeded by colder portions, then descend in virtue of greater specific gravity. When particles of water are converted into steam, they rise so very rapidly, that they carry a large portion of water with them; which, in a vessel sufficiently large, are returned through a current setting down in some part of the same vessel; there is an exceedingly rapid circulation of ascending steam and descending water when under strong heat. The steam remains on the upper surface, and the water falls to the bottom. The reason why water is driven out of tubes, is, that the particles of water being mixed, and mechanically driven with the steam, become a part of the current, and invariably pass off with it, when allowed to escape. Means by water coming out of the tubes, that when a tube is used, the area of which is not sufficient for the return current of water to pass the ascending current, then both currents become ascending, and the water in consequence is driven out. In every case, in which boilers with tubes had been used, it had been found, to the best of witness's knowledge, that the water went out altogether; engineers had not provided for this natural consequence, and the water, as the steam became formed, was always driven out; no means being provided for its return. It is evident, that if it had attempted to return by the same pipe, the heat which raised the steam to first drive it out, would accumulate in the pipe, so that it would have formed the water into steam instantly, and thus, prevent its return; therefore, to attempt to use tubes in the ordinary way, was out of the question; the tubes would burn out, as a matter of course, after the water was driven off, and no steam could be formed. The plan adopted to overcome the difficulty, was, to pass the water back again through a separate vessel, which made a distinct descending current away from the heated surface; previous to entering which, it was carried into a separate or distinct vessel provided for the purpose of separation. The steam being separated from the water, remains on the surface, and out of the influence of the heat; the water being separated, descends through a separate current, and supplies the place of the ascending portion of the current that was driven along by the steam. By these means, the difficulty of keeping water when it was under any pressure, or submitted to any extent of heat in tubes, was overcome; the separate vessel, which is called a separator, was highly essential, inasmuch as it effected a complete separation of steam and water, which had previously taken place in the ascending current, and enabled the steam to be drawn off dry for the engines; without a separator, but with the returning channel, water would pass mechanically to the engines, and the boilers be comparatively imperfect. The circulation and separation in distinct vessels, are the great points of witness's boiler. Two distinct vessels were necessary; and he was obliged to employ tubes in consequence of this becoming necessary to reduce the size or weight of the generator or boiler, for the purposes of effecting locomotion. The separating portion was almost as necessary as the circulator. The mode of separation and circulation are peculiar to his boiler. This was the principle upon which he took out his second patent. This difficulty, in the use of tubular boilers, the ascending current of steam carrying forward the water, had never before been attempted to be remedied. When Mr. Woolf, who succeeded Mr. Trevethick, in attempting to use tubes for his double power engine of high pressure and low pressure combined, reduced his cylinders below six inches in diameter, he found the water would not remain in them: this was evidently arising from the want of room for the ascending and descending currents. Mr. Woolf was not, however, the first person who introduced the use of tubes in place of boilers; they had been tried repeatedly by Trevethick, Bolton and Watt, Dr. Robinson, and others. Tubes have been attempted to be used the last 50 years, perhaps as long as the steam-engine has been in use, but they were never used with success. They were invariably found to burn out. Mr. Perkins, to overcome this natural difficulty of the water leaving the tube, proposed to keep it in by immense mechanical pressure, so great, that no particle of water should leave one end of the tube, until a particle of water had entered at the other, urged by a strong hydraulic press. Recollects Mr. Woolf stating to him that it very often happened, that the tubes or rather cylinders which he used, produced a strong percussion which broke all the joints of the boiler; no doubt by some mechanical cause, a portion of the water left the surface, which becoming hot, occasioned this effect. The cause seems to be the sudden formation of steam upon hot surfaces. Another difficulty, and a very serious one in practice, and which Woolf found when he used cylinders, (those vessels of this form, properly so called, are six inches in diameter,) was, that after a time they became filled with an earthy deposit. The size of the tubes used in his, Mr. Gurney's boilers, were about an inch.—The smallest size used in other boilers that

did not burn out, was six inches, and about three-fourths to seven-eighths thickness of metal. Earthy deposits in tubes affect them in this way; when the earthy deposit collects in a cylinder of six inches diameter, it reduces the area of it; the consequence of which is, that the circulation becomes defective for want of room, the tube then burns out. This effect, produced from earthy deposits, forming in large quantities in tubes, induced Mr. Woolf to have some mechanical mode for getting it out, which he did, by taking out the ends of the cylinders. Earthy deposits have been found in larger tubes; the evil effects of which are, first to occasion a non-conducting stratum between the heated surface and the water, which of course prevents the heat passing from the fire, and consequently occasions the tubes to become red hot, and burn out. He attempted, in the first instance, to obviate the difficulty by a chemical solution of the deposit; but he found in practice, that operatives were not always philosophers; they neglected to do it, and the boilers were therefore generally found subject to the injury of the fire: witness was consequently obliged to devise a mode of cleaning them by mechanical means. A cap is screwed over the cross end of the tube; then a rod, armed with a screw or projecting feathers, like the feathers of an arrow, or like the rod commonly used for cleaning guns, is driven up and down, till the whole of the deposit is taken off. There was no previous contrivance for cleaning the tube boilers attempted to be used by engineers, for the best of all reasons, that they never continued to use a boiler long enough to occasion a deposit sufficient to occasion its burning. Witness defines a tube to be a vessel less than a given area; the vessels in Woolf's boilers were of considerable size, and come under the name of cylinders: a tube means a vessel of less than four inches diameter, or one within which water will not circulate without extra assistance; above that, it is called a cylinder. The first set of caps witness used, being of cast iron, were liable to break, and did break occasionally from accidental blows; from their also having different properties of expansion under different temperatures their joints loosened; in his second boilers, therefore, copper caps were substituted, and from that time no accident of their breaking ever occurred. The joints were not apt to leak; they were packed in a peculiar way; the expansion of metals, at different temperatures, will occasion the breaking of most of the joints submitted to fire; but after being packed with a fire-proof elastic matter, asbestos, introduced in making the joints, the leakage arising from expansion, and consequent leakage of the joints, was effectually removed. The weight of a boiler of thin copper tubes, made as an experiment, of two horse power, was twelve pounds; does not recollect the surface presented to the fire, although it was calculated at the time. It was arranged merely as an experiment for a particular object, with exceedingly thin copper tubes; the fire was urged by artificial means. This experiment showed distinctly that intensity of fire with a limited surface was an equivalent for weight, and the great extent of surface then generally believed to be necessary by engineers for obtaining a given power. Having obtained smallness of heating surface and efficient material, and being enabled to overcome the difficulty of raising steam by very small vessels, nothing remained, but to attain a command of fire to keep up that intensity, which witness had ascertained to be equivalent for quantity; and with this view, the centrifugal fan was first used. It is now used in many iron furnaces, instead of bellows or blowing cylinders. It was found, however, inconvenient in steam-carriages from its size and was superseded by passing the waste steam of the engines into the cylinder; where by its expansion, and by directing its mechanical force up the chimney, it drew after it, and consequently through the fire, a corresponding portion of atmospheric air. This latter contrivance is very superior to the former; it is under the power of the engineer, who can obtain an intensity of fire at pleasure. There was an additional advantage in sending the steam up the chimney, in connexion with the hot air, that it passed out invisibly, so as not to make any appearance objectionable to the road; to obtain this end previously, we were compelled to throw the waste steam from the engines closely over the fire. The intensity of fire, however, produced by the second method, rendered this unnecessary; the steam was dissolved in the atmospheric air of the chimney, in the large quantity passing. In very cold hard frosty weather, the steam will sometimes condense, and appear as cloud about a quarter of a mile, more or less, in the air, after parting with the heat that held it in solution. The objection of a volume of smoke coming from a machine being calculated to frighten horses, is obviated by this mode of rarifying smoke, and is one of the practical advantages gained by subsequent experiment, which witness could not include in his patent. No smoke comes from his steam-engine, because the fuel does not give it; and the steam being heated, dissolves into the atmosphere, invisibly, and becomes a part of it. During the six years he had been making experiments, and even at first, when the machine was in a crude state, not a single accident occurred from the boiler

aing horses, although the experiments
ade in the high road; the noise from
gh-pressure engine, as generally used,
considerable; but by passing steam
e blowing vessel, the noise cannot be
If the steam were let off from the
alve in the open air, as is done from
e adjoining the mast of a steam-vessel,
i make a similar noise, but in this case
t into a box which has an opening
e fire: this so rarifies the steam, that
th invisible and inaudible. There is
g in the shape of the machine calcu-
alarm animals on the road; this has
en a practical objection; refers the
ittee to witness's former evidence in
.In narrow parts of a road the likeli-
of accident from a steam-carriage
in contact with a horse coach, is far
n where two horse carriages meet in
situation, because the steam being
y under the control of the engineer,
having a will of its own, can be re-
at pleasure, turned backwards or for-
or stopped instanter; whereas horse
es cannot be so managed. Going at
e of 10 miles an hour, and coming
10 or 15 yards of a horse coach, the
r could be more suddenly stopped
ses; because the full power of the
may be instantly reversed, which,
against the momentum of the car-
brings it up more powerfully and
than the reversed action of horses can
y do. By the steam being reversed,
at, that the steam is made to act upon
tons, so as to reverse the action of the
—in the same way as paddles are
backwards or forwards in steam-
Witness does not consider that it
be necessary to secure the public by
alties for negligence on the part of
nducting engineer. If any accident
, it must be through gross negligence,
would be amenable under the same
a common coach driver. It is not
ry to have an engineer to drive the
ge; a man might learn to drive it in
n hour. Captain Ross, previous to
out on his last expedition, came to see
rriage. He (Mr. G.) had left the
ge for some purpose, when the Captain
on the driving box, and drove for half
ar with perfect safety; he never had
previously upon it. A man behind
ed the fire—the Captain did not in-
with it; he seemed to have preference
colder berth. It does not require so
skill as to drive four horses. Refers
to evidence of 1831. There is no
calculated *to frighten horses, different*
ordinary carriage. The noise is
that of the boxes and wheels—there
ise of the steam or steam apparatus.
The shape of the carriage is so like that of a common phaeton, that it is often passed by persons without their being aware that it is a steam-carriage. There is no chance of accident from the bursting of the boilers. As a proof of this, about a twelvemonth after witness began his experiments, he took his children to Stanmore in the carriage, and placed them close to the boilers. No accident of any kind has ever happened. If one of the tubes were to burst, the hot water would not scald the people, because the water under the pressure, necessary to form steam for this purpose, expands itself upon the instant it escapes into the atmosphere, and becomes not only aëriform, but so changed in temperature, that it will produce cold; ice may be produced by expanding steam in this way. The rending or opening of tubes has often occurred, and in one case the head of a bolt bent aside; through this opening the steam and water escaped in sufficient quantities, to drain the boiler dry in about two minutes; no mischief, however, happened, although persons were standing close to it at the time; it put the fire out, but the persons did not move away, so little were they even frightened. This was the greatest danger from accident that ever occurred in the six years of his experience. Since 1831, has not had any carriage on the road. There might be greater objections to steam-carriages being used on common roads by night, than to vehicles drawn by horses, because a certain directing power is given to the will of the leaders; but with a careful driver and good lights, the amount of increased risk is not worth consideration. His carriage does not make so much noise in the driver's ear as a common carriage with horses running in front: minus the noise from the horses feet. The driver could hear a carriage approaching, at about the same distance as a common coachman driving on the box. In going down hill, he does not consider that there is any risk—refers to Report of last Committee. The calculations that have been made since, confirm the opinion then given, of there being more safety with the steam-carriage than with horse coaches; for the same reason that there is less danger when meeting carriages in narrow streets, namely, that when it is required to stop or reverse the motion of the carriage in going down hill, any portion of the steam may be employed for retarding the velocity occasioned by gravitation. The expense of working a steam-carriage at the rate of four, or even five miles per hour, is decidedly greater than that of propelling it at the same rate by horses, even if the locomotives could be reduced to 300 weight per horse power; but above this rate, the steam-carriage becomes proportionately cheaper; and the advantage

increases as the rate increases, in some ratio which is not yet decided, but far greater than a geometrical one. It is found that to obtain an increase of speed of from eight to ten miles an hour by means of horses, a double expense must be incurred; while in the case of steam power, the expense will be the same: means by being the same, that at ten or twelve miles per hour, the increase of expense is so trifling, being a question of wear and tear merely, that he should say the same per mile, especially over a good road. The expense of horse-power increases at a frightful ratio with the rate of speed; the animal is naturally and physically provided with apparatus to carry him at a rate of two miles and a half to three miles an hour; if he is urged beyond this rate, he begins to lose free power or practical effect, and at the end of twelve miles an hour the whole of his power is employed to accomplish his own locomotion. He may drag a load at that rate as an experiment for a day or two, but he could not do so long. The term "horse-power" has been fixed by engineers to express certain work, or quantity of free or disposable force at the best moving rate of a horse, namely, from two to three miles an hour done in a given time. This term was first applied to steam-engines when they were used for mill-work, pumping water, or such similar purposes. Where the engine itself was not required to move, the term "horse-power" was calculated to deceive, and did deceive the first experimentalists on elementary locomotion; they associated with the term, the actual power of the horse under all circumstances; and the same error seems to have interfered with the framers of the Turnpike Acts passed in 1831. Nothing is more natural than to overlook the fact, that a horse can only concentrate his power by a principle of vitality, and give out in one hour the quantity which had been calculated in the expression to be given out in eight hours; but that beyond his best natural rate, he would require a considerable portion of that quantity to be expended in carrying himself, in a ratio to be determined only by actual experiment and practical observation. This fact was not recollected, and therefore, because a horse could draw a ton weight, and carry himself over the common road at the rate of from two to three miles per hour, a nominal one-horse steam-engine was thought to be able to do the same. This conclusion produced gross mistakes in the first common road locomotive experiments; and even as late as 1831. To arrive at the free or disposable power of a horse at a given useful practical rate of working, as employed in the quick coaches and smaller carriages, is essential to determine the true political and mechanical value of any engine that is proposed to supersede or compete wit
secondly, the free or disposable po
engine at the same rate, must al
termined. The expense of working
wear and tear of each, must also
before any true or just estimate can
in other words, what one by natu
other must become by art. To a
conclusion with regard to the po
horse, we must either commence o
at a point of rest, or take one at a
of motion. A horse, as a mechani
is, in every sense of the word, a l
machine; for by locomotion only
made to give out his power, and a
penditure of power required to prop
at the rate of two or three miles
been determined, we have no data
we can compute higher velocities;
in the first experiment on elemen
motion, a series was made to asc
actual quantity of animal power mec
expended by the horse to effect his
motion at given velocities over th
road. The principle of locomotion
a horse moves himself, may be se
vestigated, by observing the reci
action of weights placed upon upri
or props resting on the ground, a
alternately forward; the amount of
thus placing given weights on the u
may be known by measuring the
quired to effect reciprocation, or
culating the same by the lines a
necessarily described. A horse rest
on his legs, and propels himself by d
an arc alternately on them as lev
fetlock joint is the centre of the
rests through the hoof on the gro
hoof, during the time the arc is d
by the shoulder or other joint, is st
There is no difficulty in imitating
tural movement by joints and le
measuring the actual power require
a given weight; or it may be reduc
culation. Thus—suppose a given
rest on the upper end of the vertica
(the other end resting on the gro
that it is made to describe the arc
the power or force required to mo
the first portion of the arc, nam
B to C, to the perpendicular will
out again, whatever it may be, on i
through the second portion of
namely, from the perpendicular
termination D. This power is gi
weight, and retained in the shap
mentum; and like that in a fly-wh
chinery, is distributed and expended
ing the weight up the next, or s
portion of the arc formed by the s
lever. As the force thus retained
that required to move the weight
B, C, no fresh exertion or ex

. From the second to the third, the the fourth, &c., the same is pro- and thus by one of the most simple utiful laws of nature, after the first nt, the horse requires no power to his locomotion, except that of lift- legs, and the friction in the centres ion. When it is seen how beautifully ctually the ancle joint of man, the joint of a horse, and similar joints in imals are formed, we first come to lusion, that the power required to be d in their locomotion, amounts to nothing. The leg, or lever, has been supposed to rest upon an *im-* joint; and the weight to move along *plane*. When, however, the lever a *moveable yielding* joint, the arc d is imperfect, and we shall now re- correct our calculations. Any change ielding of the road, in practice, or n of the centre, while the arc is de- , will produce a distorted figure, of a perfect curve, determined by the d change of position. An extra ill be required now to move it through portion of the curve to the perpen- which destroys the balance of the as- and descending forces; and the extra ill be *quoad* the distance sunk by the of libration; and the portion of the required for doing it. Again, in going the first portion of the arc described ever, to meet the succeeding one in endicular, is greater than the second nding from it, the chord of which allel to a horizontal line, but to the ion; consequently the power required e at or lift it to the perpendicular, er than that given out by descending The difference in the segments will it the increase of power required, and rays be as the inclination. When a drawing over a line, the arc described houlder is not one, the chord of which lel to the surface; for the descending of the arc from the perpendicular is than the ascending, in proportion to er exerted; and in cases of strong draft, ration commences at the top of the licular, in which case he has to lift his gain to the summit at every step he The distance descended from the per- lar, in a given time, will give the of power expended. From these data, ver required to move the horse, may ly known; and also the power ex- beyond it, when it is made to draw a e along a road. From these experi- and calculations, the power expended horse over ordinary roads, is found to l to about $\frac{1}{14}$ to $\frac{1}{10}$ his whole weight. the weight of a horse at 1,200 lbs. is not far from the average), the power required for his locomotion, at the rate of two miles per hour, will be about 50lbs. This power of 50lbs, added to 200lbs. (the free and disposable power said to remain at two miles per hour), will give 250 as the repre- sentative of his actual power, if he could be made to exert the same without moving his body. A man can exert all his physical power when rowing in a boat, and by other similar operations. Thus, if it requires 50lbs. to move the horse at the rate of two miles an hour in an arithmetical progression, it will require an expenditure of 100 at four, 150 at six, 200 at eight, and 250, or his whole physical force, at ten. Practice does not vary far from these numbers, and it is only by a decomposition of power, that he can be made to do any work at all at this rate. In coach work, or for quick travelling purposes, where steam power comes into competition, he is compelled to give out in one hour the same power, that under ordinary circum- stances he is allowed eight hours to expend; and thus an engine doing the work of a four horse coach for eight hours, may be said to do the work of thirty-two horses, and be called a "thirty-two horse power." To charge a toll at the rate of thirty-two horses for such a carriage, would be contrary to justice. The steam-engine at Gloucester was a twelve horse power, nominally so called; in effect, on the road, as compared to horse- coaches, it was a two horse coach. This engine, in the Cheltenham Roads Bill, was charged 3s., and the carriage which it drew after it 3s. more; so that it had to pay 6s. toll, while a two horse coach paid only 1s. 4d. The free or disposable power of an engine must be known, and brought in direct ac- count with the aforesaid data of the free or disposable power of the horse; taking also into the calculation, the observed peculiar operation of the physiological laws, and those also of inorganic arrangement, before any true comparative estimate of the value of steam locomotion on common roads can be made. The weight of a steam-carriage varies in proportion to the power; those equal in effect to a two horse ordinary coach, which will carry as many passengers, will be about one ton;—to a four horse coach, two tons, that is, empty. Witness has hardly provided in his experiments for an up-hill road, glazed over with ice, but from a mechanical communi- cation he lately received from a scientific friend, a Member of the House of Commons, he has no fears upon the subject,—a carriage might be made to go up an inclination of 1 in 12, supposing the same to be glazed or covered with frost. In going down hill, the steam is reversed, and the carriage goes down dragging the wheel. As to the originality of the in- vention, refers again to evidence of last Com- mittee; when he stated that Mr. Trevethick

might fairly and justly be considered to be the originator of locomotion by steam on railways, he would refer the Committee to his (Mr. Trevethick's) evidence, to show that he had not been able to move on the common road. In one part of his evidence, Mr. Trevethick says,—"Travelling on common turnpike roads would be by far the greatest national advantage, but which, on the present plan, never can be accomplished, because the difficulties of getting a supply of water, and the inequalities of the surface of the roads, will always, under the circumstances, prevent the limited power to ascend the hills; and this objection is irremoveable, because as the power at present increases, the weight increases in nearly the same ratio." Afterwards he says,—"At the present moment we have a proof of this from the engines travelling on common level roads, being as nearly as possible in equilibrium," which Mr. Trevethick supposed was the case at the time. He therefore evidently never started one himself, or knew very little of the practical or theoretical capabilities of steam-carriages on common roads. Mr. Trevethick further said,—"I have noticed steam-carriages very much; I have been abroad for a good many years, and had nothing to do with them until lately, but I have it in contemplation to do a great deal on common roads. Railroads are useful for the sake of speed and safety, but not otherwise; every purpose would be answered by steam on common roads." When, he says, "I meant to do a great deal," it appears from the evidence, that that was by condensing steam, and bringing it back in the form of water, and getting rid of the weight, showing that he was not aware of the state the subject was in. This is important as far as it goes, because witness believes that the only person who can can claim originality is Mr. Trevethick; now he himself does not claim it. Mr. Trevethick died since the report of the last Committee. That report contains Mr. Trevethick's views upon the subject fully; and shows his proposition for condensing water after it had been used as steam, as being essential for locomotion. Witness considers Mr. Trevethick to be the inventor of locomotion on railways—that to him is due all that has been done on railways; and that the steam-engines used at this moment on all the railways, are decidedly those invented by Mr. Trevethick, with slight variation. At Manchester and Liverpool there is simply a substitution of a series of flues for the fire flue, the one large tube which he used. He considers Mr. Trevethick to be entitled to the gratitude of his country for such an invention, and has no doubt that his invention will be followed by effects on society scarcely credible at this moment. The high-pressure engine, for which Mr. Trevethick ha credit, is the only one (of the sort) capa effecting locomotion to any advantag railways or on common roads. Before Trevethick took up the question, no had been done; several reports and ments have been made by the Ger Americans, Frenchmen, and persons of countries, all of whom are now anxi claim the origin of this important in In a work lately put into his hands, a was made to the originality forty years but unfortunately for the claimant, the is said to have been done by a low-pr engine, which must have weighed a t least per horse power, exclusive of the necessary for condensation, which would been half a ton more. This physical i sibility is an answer to this claimant others will no doubt be found to be similar description. Mr. Trevethick, fore, is the first who actually made a tical trial towards the subject at all although he failed on common roads, l plied it successfully to railroads—to h periments the present success on railw entirely owing. After witness had the practicability of applying steam to motion on common roads, and had come some of the great practical diffic the subject was taken up by several persons. Amongst the first was Mr. cock; he however, did not turn his att to it, until he (Mr. Gurney) had drive repeatedly round the Regent's Park the carriage had gone up Highgat Mr. Ogle followed Mr. Hancock. Mr. did not succeed in making a successf periment. Mr. Heaton tried, and, it i failed. Dr. Church had not, to his ledge, been out. He did not believe the engineers who had followed him established carriages in the public se they have been going on with exper since 1831, when he was compelled to and from the best authorities it woul pear that no great advance has been m the subject from that time.

"Do you consider your invention so completed, that if you were to m carriage immediately to run on the r would not be liable to much improve —Decidedly so; improvements will g the subject, no doubt, for fifty years; b carriages are now so perfect, as to faster, cheaper, and safer than horse c on common roads."

So far as witness's opinion goes, he states the invention perfect at the time stopped at Gloucester. After the f steam-carriages moving on common was proved, a few capitalists began to seriously of it as a property; after the j up Highgate-hill, by which the fact of

le to be propelled up the steepest proved, witness sold one-sixth por- he patent for 5,000*l* to General, James, Viney—that was in 1826. experiment in going up hill had de, all difficulties appeared to be , except those of a practical nature. ion of the patent right was assigned al Viney to Sir Charles Dance. By ment with General Viney, the road Gloucester and Cheltenham was lusively to him, at his particular a consequence of his being a native ester. Consequently, when Sir Dance purchased General Viney's e acquired sole possession of that put his first carriage upon it. This nly reason why it was first estab- e, and not nearer to the metropolis. age between Gloucester and Chel- vas established in the spring of r the journey to Bath, in 1829. It ur months, with the exception of ys only, three times a day. *The olls were the cause of its withdrawal.* of the Committee having drawn attention to the fact, that the m Road Bill, imposing a toll on riages, had passed *previously* to the 1830 and 1831, witness says he ow whether it was passed or pass- the best of his knowledge, when running between Gloucester and m, there was no toll on the road. kes collected no toll; the manager te told the engineer, that they in- fill up the road first, and "if that top him, they would get a tickler London,"—meaning an Act of t. Loose stones had been put on eighteen inches deep, about the 2d of June; the carriage went he stones three times; horse car- . the mail were stopped; waggons nately the great strain required to gh such a formidable resistance, axle; the carriage, however, was be repaired to resume its labours. Dance shortly after wrote a letter, printed at the time, in which, of the great hostility he had met ious ways, he concludes with say- as resolved, however, not to do any ile if possible, and felt only pity mpt for those who could resort to s for preventing a great national g; but I was convinced the public growing more pleased with the ; passengers from all parts of the declaring their satisfaction and shes for its success, and the lower pressing their conviction, that the n of steam for horses would tend mfort and relief; it was my inten- tion to have strengthened my wheels, and to have gone on in spite of any obstructions. But in the course of the following week, I learned that a vast number of Turnpike Bills had passed, and that more were passing through both Houses of Parliament, granting tolls upon steam-carriages, which would be a complete prohibition; and that the Cheltenham trust was one of the number. Feeling that we were thus likely to be defeated by Acts of the Legislature, in addition to the other difficulties, I relinquished my intention of continuing to run the carriages, and hastened to London, where I arrived in time to consult with you as to your petitioning Parliament, which led to the appointment of the Committee of the House of Commons." Being asked whether it was not the accident and the opposition of the trusts which caused the carriage to be given up?—witness answers, that it was decidedly the amount of tolls—that they did not care for the stones, as they could have gone over them with very little extra strength, and would have gone on in spite of all opposition; but seeing Government was determined to obstruct the subject, they withdrew. The toll on the Cheltenham road was three shillings on the steam-tug, and three shillings for the carriage drawn. Does not recollect how many turnpikes there were. On a four-horse coach the toll would have been two shillings and eightpence,—it would have made no difference to unite the two carriages into one. Such toll for a fair distance would not have been sufficient to drive steam-carriages off the road, but for a short distance it would. It is with steam indispensable to have two carriages. The steam-tug was equal to two, not four horses—the other carriage the ordinary coach. The tug did not do so much harm to the road as the trampling of four horses. The other difficulty was the local opposition from the turnpike-trusts, but that would not have stopped the undertaking, as it had been expected; it was the Acts of Parliament. Agreements had been entered into with capitalists who took an interest in the subject, for carriages to Exeter and Plymouth from London,—to Exeter and Plymouth from Bristol,—and also from Exeter to Plymouth. And upon the Exeter road, the Teignmouth and Dawlish road, and part of the road from London to Exeter, the toll was as much as two guineas. Had no direct interest in the carriage running between Cheltenham and Gloucester.

Further examined as follows:—

When you were before the Steam-Carriage Committee (1831), was it after the accident happened on the Cheltenham road?—It was.

Did you *then* give evidence as to the carriage having been given up on that line, on

account of those Acts of Parliament which you state?—No, I did not; the question was not asked me; nor did I know then what Sir Charles's ultimate decision would be.

Were *other* persons engaged in travelling in steam-carriages upon roads deterred from prosecuting their inquiries, or experiments, on account of the Acts of Parliament?—I do not know.

Would not the same Act of Parliament which affected you, also have affected them?—It would, if their carriages were the same as mine; if different in their construction, the tolls would be different; some proposed to carry their passengers; some were single bodies; some proposed three wheels; and others six wheels, and so on.

Knows that Sir Charles Dance ran a carriage from London to Greenwich for a short time, and that he also attempted to run a carriage from London to Birmingham; but he took the separator away from his boiler, at the recommendation of Messrs. Maudsley and Field, and, in consequence of removing the separator, which is one of the great points in witness's patent, the water came through the boiler, and the carriage stopped half-way. Has no correct information as to whether Sir Charles has made any material alteration in the boiler; he is said to have put two boilers together, and to have left out the essential part, the separator. Has heard that Sir Charles has taken out a patent of his own in connexion with Mr. Field. Since the discovery that the friction of the wheels is sufficient to propel carriages, all attempts to improvement have been entirely confined to the boilers.

Being asked whether, from the circumstance of Sir Charles's attempting to take out a patent for another kind of boiler, he did not think witness's boiler imperfect?—Answers, that Sir Charles Dance is no engineer, and is constantly changing his opinions; cannot say what induced him; supposes that it is for what he conceives to be an improvement in certain parts; it is not, however, Sir Charles's patent, but there is an arrangement between him and Mr. Field, which made it necessary that the patent should be taken out in his name. The contract, previously spoken of, was made with Mr. Hanning, of Dillington Park, Somersetshire; the value of the contract was estimated at 700*l.* a-year for every carriage. Mr. Hanning defeated the contract by stating, that it was quite useless to introduce the subject on any roads, while the principle of so heavy a toll was sanctioned by the Legislature. Gives in, another contract with Captain Dobbyn for the road between Bath and London, on account of which he received 4,500*l.*, of which he returned 2,000*l.* This contract, too, was broken in consequence of *the panic*. Witness's next contract was with Mr. Bulnois, on the road from London to Brighton and Southampton; cannot show that it was broken from the same cause as the others, but presumes that the same panic affected Mr. Bulnois. Produces another with a Mr. Ward, for the road from London to Manchester and Liverpool. That contract was not broken; the reason why it was not executed, was principally on account of another negotiation interfering; the tolls were not the cause. There was a contract on foot for the Scotch Patent, which was broke off on account of the tolls. There are carriages running at present between Paisley and Glasgow, but these did not exist when witness's carriages were stopped, and therefore could not be affected by the same circumstances. They are now in a state of experiment; his were in a state of perfection four years ago, and no experiment was left to be made. There was a contract with Sir Charles Dance for the road from Birmingham to London and Holyhead; it was made the same week the carriage stopped at Gloucester, and was contingent on the tolls being repealed. The carriage was perfect at the time of running at Gloucester; the difficulties which turned up in practice at that time were not of a serious nature. Had no doubt whatever of success, neither had Sir Charles Dance. "The carriage will go on improving for the next 600 years to come, like all others; but the carriages then at work were capable of beating the coaches in time; were running at a profit, and carrying the public at one-half fares." To prove this, witness read a statement of Mr. Stone's (Sir Charles Dance's manager), as follows:—"We have made altogether 396 regular journeys, making 3,644 miles in all; the number of passengers who paid fares 2,666. Our receipts have been 202*l.* 4*s.* 6*d.*; our expenses in coke altogether 78*l.* One-third of this coke has been burned in experiments when we were not running." Witness received 500*l.* premium on the Brighton road contract, and 600*l.* on the Birmingham road, no part of which was refunded.

Mr. David Dady examined.—Was Mr. Gurney's foreman from 1824 to 1832; confirms different portions of Mr. G.'s evidence; laid down 8 carriages in consequence of the contract with Mr. Hanning, but built only 3; is of opinion that the imposition of the tolls on steam-carriages was the reason of the manufactory being given up.

Mr. Samuel Gurney examined.—Confirms Mr. Goldsworthy Gurney's evidence in several particulars; understands that Sir Chas. Dance withdrew from the Cheltenham road in consequence of the local opposition that was shown him, but his chief motive was that of the tolls—certainly not in consequence of its not answering as a speculation; Sir Charles

seemed to think that the Legislature would prevent steam-power being available on common roads.

Mr. William Bulnois examined.—Entered into a contract with Mr. Gurney to run carriages on the Brighton and Worthing roads; did not order any carriages; was not to have his till other parties were supplied; Mr. Hanning and Captain Dobbyn were not to be supplied till Sir Charles Dance and the others had their contracts fulfilled in succession; the tolls were levied on the Worthing road, but does not mean to say that that was the reason for abandoning the contract; does not consider it abandoned now; doubtful whether he would go on with the contract if the tolls were not levied; paid Mr. Gurney 600*l.*; cannot say for a certainty that the impediment to the speculation was the imposition of tolls; Sir Charles working his carriage for a long time proved that the carriages were running with success; thinks Mr. Gurney must have made a great sum of money up to this time; has seen nothing that has done more than Mr. Gurney's carriage; went with Sir Charles Dance's engines to Brighton in this last year; up to the time of breaking down, considered it superior to Mr. Gurney's, considering the distance; has seen Mr. G.'s go as well for a short distance; the machinery gave way; there was no fault in the invention; was going down Slaughton-hill at a great pace when they reversed the steam, and it strained the piston-rod very much; afterwards it broke; were going down the hill at the rate of 16 or 17 miles an hour.

Mr. G. H. Ellis examined.—Was Mr. Hanning's attorney upon the subject of buying a share in Mr. Gurney's patent; he stipulated for eight and a half parts or shares out of twenty-four, for which he was to pay in all 8,000*l.*; Mr. Hanning paid altogether not less than from 6,000*l.* to 10,000*l.*; he was deterred from going on by finding that he could not turn it to advantage without mixing himself up with the actual manufacture of steam-carriages, and he did not wish to make himself in any way subject to the bankrupt laws; it became a disagreeable subject to him; he had advanced a great deal of money to enable the patentee to go on, and he probably expected that he might be called on for more unless he withdrew; Mr. H. was the only monied man of the party, and for every experiment the expense fell upon him, and he was more displeased with having to supply the money than with any thing else; he was of opinion that it would succeed if there were parties to come forward with money; he directed witness's partner to support the prayer of the petition to the House of Commons against the Cheltenham Road Bill, which contained a clause enacting very heavy tolls on steam-carriages; understood Sir Charles Dance went off the road in consequence of an accident; the trustees of the road, as he understood from Sir Charles Dance, contrived to put an end to his experiment by putting a great depth of granite upon particular parts, so that the axle of the carriage broke immediately on coming upon it; Sir Charles did not think it worth while to have the carriage repaired; there is no doubt that Mr. Gurney was a considerable loser from the obstacles which the tolls placed in the way of his patent, assuming that these tolls prevented parties taking their contracts; this was the cause, among others, which prevented a client of witness's putting coaches on the western road.

Mr. Goldsworthy Gurney further examined.—The local acts which were passed, putting obstacles in the way of running his carriages, operated on a great many of the roads contracted for, but not on all; it was stated that it was the intention of the Legislature to extend the acts as soon as carriages were established on the various roads; a Committee sat in 1831, at the instance of witness's petition, to inquire into the subject, and recommended legislative protection, stating that the tolls were prohibitory in the acts that had passed; a bill was brought in immediately after for their repeal, and passed the Commons without opposition, but was thrown out in the House of Lords; the public considered that the Legislature refused to repeal the acts that had passed, and that they were considered to be precedents for acts on any road on which steam-carriages should be used; it produced a conviction that the subject was opposed by the Legislature; the panic was renewed in consequence of the bills being thrown out by the Lords; most people considered that these acts, imposing tolls, had been passed without a clear understanding of the nature of the subject; but when the subject had been investigated for four months, and when the Committee had recommended legislative protection to the subject, then, since the Legislature refused, under those circumstances, to repeal the acts, this, added to the fact of the carriages being withdrawn from Gloucester, gave a generally unfavourable opinion as to their work in practice: it completely put an end to all proceedings on witness's part; he had no capital left to expend on the subject, having expended every farthing in experiments to bring it up to the state of practicability it was then in, when running between Gloucester and Cheltenham; recollects the great alarm in which Mr. Hanning came to town; a special meeting of patentees was called, and witness sent his brother and clerk to ascertain what was Mr. H.'s intention respecting the finishing

the carriages he had ordered. His answer was—"It is of no use attempting to establish the subject in the face of the Government, or to lay out a single shilling further, until we see that the Government do not really intend to oppose us; therefore you must lose no time in petitioning the House, and having the case investigated and inquired into, so as to arrive at the determination on the part of the Legislature." Several other pending negotiations, over the great roads of England and Ireland, were broken off in consequence of the tolls.

John Ward, Esq., examined.—Paid Mr. Gurney 500*l.* on a contract for the road between London and Liverpool in 1825. Contracted also for the Scotch patent in 1831; was to have paid 15,000*l.* in instalments of 5,000*l.* Never paid any part of this sum. Did not pay because of the heavy tolls being put on, which amounted, in witness's opinion, to a prohibition. There were tolls imposed on seven, eight, or nine roads in his particular line; on the Prescot road, on the Coventry, the St. Alban's, the Bathgate road between Edinburgh and Glasgow, the Highgate Trust, and others. They affected him too sensibly to think of paying a sum of 5,000*l.* Was, even then, sanguine of the capability of the carriages. His reason for giving up the contract was, the fear that the tolls would not stop there, but that they would be extended to become a prohibition of the invention. Purchased the whole of the Scotch patent from Mr. Gurney, and was prevented from fulfilling the contract solely on account of the opposition of Government. Was negotiating with a most respectable house in Edinburgh for the sale of the Scotch patent right for 32,000*l.*, which negotiation was broken off in consequence of the tolls being imposed. Some of the parties with whom he treated were engineers themselves, and were convinced of the efficacy and practicability of the engines. The tolls on the Highgate, Whetstone, St. Alban's, and Coventry roads, amounted to 5*s.* each—for two carriages that would have been at the rate of nearly 1*s.* per mile, taking the length of the trust; and as it was contemplated to run small posting tugs, it must have been a prohibition. On the Edinburgh line the Liverpool and Preston was 12*s.* each time of passing. The Liverpool and Preston was charged on the horse power, and would amount to 2*l* 8*s.* each time of passing. The Bathgate-road, between Glasgow and Edinburgh, amounted to 1*l.* 7*s.* each time of passing.

Mr. Thomas Bailey examined.—Was principal engineer to Sir Charles Dance; managed the working of the carriages; thought they would answer the purpose very well indeed. *Understood* that it was the tolls that stopped the running of the carriages. There was was a trifling defect in the boilers; a few of the tubes gave way on the road; the seams of the pipes gave way through imperfect workmanship and materials; the pipes were then butted together; they were afterwards overlapped and welded down; which is done to this day. The carriages ran between Cheltenham and Gloucester for four months; many persons travelled by them with perfect confidence; a little prejudice existed at first, but that was wearing away. No accident of any kind happened, except the overturning of a gentleman's carriage through a spirited horse. Did not frighten horses on the road any more than ordinary stage-coaches. Was of opinion that the carriages were not at that time running at a profit; the traffic between the towns was not sufficient; had sometimes three or four, and sometimes more than twenty, passengers in a journey. The carriage broke down on account of an unusual quantity of stones, 15 inches deep, being laid on the road; it went over twice, but the third time the axle broke. The passengers were obliged to alight from other carriages, and extra horses were attached to them to draw them over. The stones were laid down on purpose to obstruct the steam-carriage. The axletree was mended, but it did not again run on that road in consequence of the tolls, as witness thinks.

Mr. David Dady re-examined.—Estimates, on a rough calculation, that the expenses of Mr. Gurney's manufactory from 1825 to 1830 amounted to about 16,000*l.* or 17,000*l.*

Alexander Gordon, Esq., C. E., examined.—Has been allowed the walk of several factories where steam-carriages were constructing, and has travelled altogether nearly 2,800 miles by them. Has conversed with Sir Charles Dance, who was certainly much disappointed at the opposition which he met with on the Gloucester and Cheltenham road; he attributed his ill success to the opposition of the land owners, and of the road trustees; he particularly alluded to the tolls. Judges that Sir Charles would have continued, had it not been for these tolls. Never heard him talk of it as a profitable speculation—should have met him immediately with the observation, that he had too expensive an establishment ever to make so short a line a profitable one; he took that line with a view of extending it to Bristol. Except in the mode of putting together, and in the advantage of better tools, has seen no improvement since the date of that carriage: nothing in point of principle. If a steam-carriage were to be constructed now, the same principles should be followed, or nearly so. Believes it to be the opinion of all other engineers, as well as himself, that the subject was altogether *in*

subibus, till Mr. Gurney took it up. He practically illustrated the practicability of propelling by adhesion of wheels to the surface of the road, and showed that the scientific world had been proceeding upon fallacious notions up to that time. Several plans were proposed for propelling by other means, and it was thoroughly believed by engineers, that it was impossible to ascend a hill by the adhesion of the wheels to the ground. In the month of November, 1833, witness was requested by Mr. Telford, Mr. Field, Mr. Cubitt, Mr. Donkin, Mr. Timothy Bramah, Mr. Macneill, Mr. Simpson, and several other scientific gentlemen, to arrange for an experimental trip with a steam-carriage ac- Birmingham; the result was not so satisfactory as could have been wished, as far as regarded speed, but it convinced them, and they signed a report accordingly, that they believed the thing was practicable. That carriage was fitted up with a modification of Mr. Gurney's boiler, but not an efficient modification, because one of the principal points which Mr. Gurney had turned his attention to was neglected—that is, the separation. Witness had the management of the stations for supplying coke and water, and of course took a little interest in the filling of the tanks as they came to the stations, and was surprised to see the immense quantity of water evaporated, or which appeared to have been evaporated; and in looking over his notes shortly afterwards, was convinced that they had been blowing water along with the steam through the cylinders of the engines, thus making a great demand for water. A pipe became defective before they had got five miles out of town, and another at Stoney Stratford, 51 miles—this probably arose from their being heated when left partially dry, from the water being in a frosty state. If Mr. Gurney's system of separation had been adhered to, this would not have taken place, and the carriage would have arrived in Birmingham in very good time. Engineers have thrown cold water upon the subject until very lately, indeed, until the trip in November. The principal engineers seem to have considered it a very doubtful matter, whether a steam-carriage could go at all; they seem to have doubted whether the practical difficulties were overcome. These opinions all go to show that there was an impression abroad, that prohibitory tolls and other moral difficulties were thrown in the way of steam-carriages, and that they could not be proceeded with—means by moral difficulties, that impressions had gone abroad amongst the landed interest, that it was contrary to their advantage that steam-carriages should be introduced, and amongst road trustees also, who are of course intimately connected with land and agricultural pursuits; and these altogether combined to form a very serious opposition to the introduction of steam-carriages on turnpike-roads. The impression of those gentlemen with whom witness had conversed was, that the heavy tolls that were imposed were very much against the subject; indeed, it was notorious at the time, that Mr. Gurney's carriages, the property of Sir Charles Dance, were stopped at Gloucester, in consequence of those prohibitory tolls. There were a great many roads in the kingdom not affected by tolls, but an impression seemed to have gone abroad that the Legislature set their faces against the subject; amongst the road trustees this feeling was most strongly exhibited, for toll-gates had been shut against them. He went on one occasion to ask the Secretary of Waterloo bridge if he would give permission to take up passengers upon the bridge, and he at that time said that he did not think his Directors would be inclined to entertain the subject at all, or even to allow the carriage to run on the bridge. The stoppage regarded as much the roads on which there were no tolls, as those on which tolls existed; but there was a fear abroad that they would be stopped by tolls at a future time. In witness's mind, this impression upon the public was sufficient to account for the sudden suspension of Mr. Gurney's manufactory and pursuit of the subject. One gentleman who intended to run the carriages fifty miles out of London, and back again, and to make a trade of it, gave it up on account of the tolls. Saw a manuscript letter of Sir Charles Dance's, attributing the suspension of the carriages to the tolls. Went with Sir Charles one night to the Institution of Civil Engineers, and introduced him there. The chairman (Mr. Telford) called upon him to state any thing he had to state upon the subject of steam-carriages, and Sir Charles then said that the stoppage of his steam-carriages was on account of the tolls that were imposed, not upon that road, particularly, but upon various roads; in short, that while he was encouraged by the poor people of the community, the land owners had taken these, as well as other means to crush him. Sir Charles stated this publicly; did not give any other reasons of a financial nature. Has given the subject much attention, and watched the progress of many carriages minutely; and ventures to say, as an engineer, that Mr. Gurney's steam-carriage would be a safer mode of conveyance than any horse conveyance; that his boiler, properly made, even if an accident should happen to it, would not be attended with any loss of life; that it is much more manageable than any horse conveyance can be; and that it would be a very profitable speculation. Had it not been for the tolls, the carriages would hav

been in profitable operation, both to speculators in the carrying trade, and to Mr. Gurney, the patentee. Has not the least hesitation in saying that Mr. Gurney is the person who gave it birth, and brought it to a practical state. His carriage has given birth to all that are now running; they have been successful just in proportion as they have followed the principles which Mr. Gurney found it necessary to introduce. Has seen and ridden by a carriage that trenches very closely on Mr. Gurney's patent, the principal defect in which, is, not having a good circulation. The owner has got a circulation upon Mr. Gurney's principle, and he has lately introduced a larger separator to his boiler, in order to come near to the other principle; Mr. Gurney's two principles are separation and circulation. With regard to that boiler, with regard to Mr. Hancock's and other boilers, they are defective because they have not adhered closely enough to the rules Mr. Gurney acted upon. They have blown the water in a frothy state into the upper part of the boiler, leaving the lower part dry, in consequence of which the tubes are subject to be burnt. Could not say whether they followed this plan, because they did not approve of Mr. Gurney's principle, or for fear of invading his patent; did not know—but should think some of them were aware of the importance of a good separation and circulation. Thinks that engineers are particularly ignorant upon this subject. There was a case mentioned in the Institution of Civil Engineers, of two boilers fitted up for the same engine, and of the same size; one of them had been at work nine years, and the other boiler was burnt out in three weeks after it was put to work, upon an extensive boiler-maker's premises. Although separation appears to have been good in that case, circulation was far from being so. Mr. Hancock's boiler is now being extensively used; does not know that it has any approximation to Mr. Gurney's principle; the defect of the boiler is, that it has not the same safety as Mr. Gurney's. Mr. Hancock's boiler has been attended by one lamentable accident; a man was killed who was close at work beside it, and there appeared to be great difficulty in accounting for the accident; in witness's opinion it was entirely to be attributed to water being blown up to the surface, and being unable to escape through the safety-valves with the same rapidity that steam would, the lower part of the boiler being at the same time burnt by its exposure to the intense fire.* There is a modification of Mr. Gurney's boiler, now being introduced by Mr. Field; believes that it is intended to run to Birmingham. If this carriage should break down, does not think that it would affect Mr. Gurney's principle—though it would the subject generally; the builder is only availing himself of circulation—his separation is imperfect.

Michael Farraday, Esq. D. C. L., examined.—Is the Fullerian Professor of Chemistry at the Royal Institution, also a member of the French Institute. Mr. Gurney's steam-carriage was the first that he ever heard or read of. Is not aware of any that ever approached the practicability of running on common roads before. At the time Mr. Gurney's proposition was made, to run steam-carriages on common roads, most scientific men were of opinion that it would be impracticable; that the wheels would not hold upon the roads. Witness, on the contrary, asserted at the time, that there would be no difficulty with respect to the wheels laying hold of the road, and that its failure must depend upon other points than that, if it failed at all. No other objections occurred to witness at the time. Public opinion has changed in favour of the subject; but cannot say whether scientific men are of opinion that it will ultimately succeed or not. Believes Mr. Hancock invented a steam-carriage; saw it standing still on the Kilburn-road, something having given way. The tubular boiler is stronger, and less dangerous, than the other species of boilers; the smaller the tubes the greater the power they can resist; there is no doubt of it; the stronger, clearly, as regards any given pressure to be obtained within them; and there must of necessity be far less danger with them than with the mere plate boilers. If that portion of the boiler which is constantly exposed to the fire were continually filled with water, it would be likely to last longer than if exposed to the fire without water, and having merely steam in it. Cannot speak as to the difference of construction between Mr. Hancock's and Mr. Gurney's boilers.

Rev. Dionysius Lardner, LL.D. examined.—Believes that the originality of Mr. Gurney's invention lies in the boiler, and that it is the first that was ever used on turnpike-roads of any kind. Trevethick, when he first contrived steam-engines for railways, in 1804, contemplated in his original patent the project of running the carriage which he had constructed upon a turnpike-road. Believes, however, that he never tried it, or if he did,

*How far this opinion of Mr. Gordon's is consistent with the real facts of the case, may be seen by referring to the account of the inquest on the body of the person who was killed, given in the Mech. Mag., vol. xviii. p. 204. The verdict of the jury "was *accidental death, caused by the deceased's own negligence.*" So far from there being any "difficulty in accounting for the accident," it was clearly proved to have arisen from the deceased's having improperly fastened down one of the safety-valves.—ED. M. M.

failed; never after used it except on railways, nor recurred to his idea of trying it on roads again. Believes that Trevethick himself considered his experiment a failure. Entertains no doubt that Mr. Gurney first brought the subject to a practical bearing; he had no one to divide the credit with him antecedent to his first introduction of the project. After, however, he had exhibited a successful experiment, and accomplished a long journey, a great deal of public attention was excited, and a great number of speculators took the field; all sorts of changes were rung on Mr. Gurney's ideas, and a great number of experimental steam-carriages have been exhibited with more or less success. Does not consider any of them better than Mr. Gurney's. All boilers intended to impel steam-carriages on turnpike-roads should be—1, small in magnitude; 2, light in weight; 3, strong, to resist severe pressure; and, 4, capable of producing steam with great rapidity. Thinks these are the principal requisites. In Mr. Gurney's boiler the water is contained in a great number of small tubes, and in strong iron cylinders; the tubes are exposed to the immediate action of the fire; thus a great number of threads of water are exposed to the influence of the heat. One of the difficulties which attend the construction of small boilers, in which it is desired to generate strong steam at a very rapid rate, arises from the destruction of those parts of the boiler within which water is not contained, by the action of a furnace in that state of fierce combustion which is always necessary for the rapid production of steam in small bodies. Has witnessed a new set of grate bars melted in a single trip between Manchester and Liverpool, within the space of an hour and a half. In Mr. Gurney's boiler, every part exposed to the action of the fire, whether directly or indirectly, is filled with water; even the grate bars themselves are tubes of iron filled with water. The consequence of this arrangement is, that as fast as the fire imparts heat to the metal, that heat is taken up by the water, and carried off to the superior parts of the boiler. Is not aware of any other locomotive boiler in which this end is so perfectly attained. One difference between it and other boilers is, that in the other boilers the grate bars are solid iron, and the fire destroys them; in this case the grate bars are filled with water. There is another point—the grate bars slope upwards, rising towards the back. When the fire imparts heat to the water, it does one of two things; it either renders the water hotter, or converts it to steam. In either case that renders it lighter; consequently it acquires a tendency to ascend, and it runs up to the back of the grate. There it encounters another set of tubes in the back of the grate, and it rushes upwards through them; it then encounters a third set of tubes, which form the roof of the grate, and those tubes slope in a contrary direction to the lower ones, for they slope upwards from the back to the front; consequently it will again ascend, and it rushes back to the front of the grate; there it will rapidly pass into the state of steam, because it has already been heated in the bottom and in the back of the fire-place, and it is exposed the less to the radiant heat of the fire below. In the front of the grate there is a chamber to receive the steam thus formed, which subsequently works the engine. Does not know that any other engine possesses those qualities in the same degree. The water is kept in connexion with the lower portion of the tubes thus:—in the front of the grate there are three strong cylindrical vessels, placed across, one above another, communicating between top and bottom of the grate by two strong upright cylinders, all filled with water; in the cylinder below the grate, are inserted the tubes that form the grate itself; and in the cylinder above the grate are inserted the tubes which form the roof of the fire-place. Thus there is an open communication from the cylinder below the grate to the tubes that form the grate bars, through the tubes that form the back of the fire-place, which are vertical in their position; and then again through the tubes that form the roof of the fire-place, communicating with the cylinder which is at the top of the door of the fire-place, so that there is a complete communication all the way round. Now the cylinder which crosses the top of the fire-place, and the cylinder which crosses the bottom, are united by vertical cylinders, so that there is a circle of water running completely round; the steam bubbles rising continually into an upper chamber, apart from the action of the fire. Speaks from actual observation, as well as theory, having seen a small model in which the tubes, both in the bottom and in the back, and in the roof of the fire-place, were of glass; and the water was seen running with wonderful rapidity round, the steam bubbles forming and rushing out at the top. Circulation is indispensable in a boiler of this description, Tubular boilers are not new, but this form and application of them are entirely new. By the process, the water is kept in contact with the tubes. Describes the separator. In ordinary boilers, the same vessel is a receptacle for the water and the steam, the water occupying the lower, and the steam the upper part of the boiler: the state of ebullition in which the water is usually maintained is such, that the water is dashed up amongst the steam in the upper part of the boiler, and much of it remains suspended in the steam in a minute state of mechanical subdivision. It is found

necessary in large boilers to have a considerable height between the surface of the water and the roof of the boiler, in order that the spray may subside without passing through the steam tubes into the cylinder; this spray is what engineers call *priming*, and as it has no elasticity, it is mere waste of heat, besides other injurious consequences, if it be allowed to pass through the cylinder. The separator is a contrivance invented by Mr. Gurney, and is a steam chamber distinct and separate from the boiler; its object is to effect the separation of the priming from the steam, before the latter is allowed to pass into the working cylinder. Has seen perfectly dry steam rush from the pipe of the engine; and this would not be the case, if the separation were not complete. The steam chamber may be so great that the water will separate itself, as it does in a large engine; but thinks the separator a very material appendage in small boilers of this kind; and does not think any but small boilers can be applied to the purpose in question. Has seen boilers of a considerable size employed, but not with advantage. The term scientific world, is generally applied to men of abstract science, in contra-distinction to practical engineers and manufacturers; thinks that men of abstract science too often entertain distrust of projects, pretending to great advancement in practical improvement. A conspicuous example of this presented itself when it was proposed to extend steam navigation from rivers to the open sea; the project was generally scouted by scientific men, who could scarcely be prevailed upon to listen to it for a moment with patience. Their opinion in like manner was extremely adverse to the probability of steam-carriages succeeding; the experiments both on railroads and on turnpike-roads have, however, produced some degree of conviction, and there is a more favourable opinion prevailing now than heretofore: thinks that the opinion of practical engineers is more favourable; but the fact is, that such large interests are involved that you can hardly ever get an opinion which is a genuine one. If you consult an engineer who is engaged in railways (and this comprises a large section of the profession), you will find that he will express utter incredulity of the possibility of ever working the steam-engine on common roads. If, on the other hand, you consult other engineers who have been engaged in the construction of turnpike-roads, you will find prejudices quite as violent, and a bias not less disproportioned to the evidence in favour of working turnpike-roads against railways. Conceives the opinion in neither case of any value; believes the steam-engine applicable, practically, *both to railways* and turnpike-roads, *less, perhaps, in each* case with advantage, *than the advocates of* the respective systems represent, but certainly with more advantage in both cases than horse power. One reason for its not having sooner come into practical operation in this way, has been the distrust of capitalists as to its success; but a still more cogent one is, the notorious fact, that in cases where steam-carriages have been established to advantage, prohibitory tolls have been laid upon the roads, so as to render it impossible to run them. Although prohibitory tolls have not been laid upon all roads, there exists the idea, that the moment a steam-carriage is built and placed on the road, the projectors are liable to be stopped immediately by a prohibitory bill being passed. Thinks that there is no one to divide the credit with Mr. Gurney, as far as regards the original invention; although, since Mr. Gurney first promulgated his ideas, and reduced them to practice, there has certainly been much done in matters of detail on railways, and also in carriages for common roads—for instance, the producing a blast through the fire, by projecting steam through the chimney, is one of the greatest improvements that has been brought forward. Believes that this was discovered by accident by Mr. Hackworth, at the time of the carriages being constructed for the Manchester railway, in 1827; he threw his steam up the chimney, not knowing what else to do with it, and found it to produce that effect; is not aware that it was an invention of Mr. Gurney's, but knows that he has applied it with great advantage to his steam-engine. The manner in which the steam is thrown into railroad engines, is accompanied with a loud coughing noise, which would be quite inadmissible on turnpike-roads. Mr. Gurney has contrived an improvement by which this objection is removed: instead of allowing the steam to escape directly into the cylinder, he receives it into a separate vessel, or blowing box, from which it is allowed to pass into the chimney in a continuous stream, without noise. Thinks steam-carriages could not run on common roads without all the advantages he has described as emanating from Mr. Gurney's invention—though such advantages might be obained by other means; but obtained they must be. Thinks many of the carriages that have since been adopted are in spirit only modifications of Mr. Gurney's principle; but does not mean to say they are infractions of his patent. Thinks Mr. Gurney's carriage can be run with safety to the public, when constructed with proper proportions and proper strength. The calculation of the comparative cost of running steam-carriages and four horse coaches, contained in the evidence of Mr. Gurney before the Committee of the House of Commons on Steam-carriages, in 1831, appears to witness to be a fair one; it

idedly in favour of the cheapness . Thinks the improvements which age requires, to adapt it for perma- l advantageous work, are chiefly tters of detail relating to the pro- and comparative strength of the ich persons skilled in coach-making ctical engineering, would be more at to suggest than the inventor him- any other scientific man. Great nents might be made, which have on to the principle of the invention tters of detail—workman-likeim nts; and thinks this the rock upon l steam inventors have split. They ; had recourse sufficiently to working s and coachmakers, but have at- to execute themselves what required nticeship to several trades to be able rm efficiently. Never corresponded embers of foreign learned societies present subject, but has heard of an n of the name of Evans, who exhi- me such experiments at an early Has seen Mr. Hancock's carriage; think he can claim any merit sup- belong to Mr. Gurney. The dif- between Mr. Hancock's and Mr. 's, is in the way in which the water is to the fire; the same difference as between a tape and a rope. Mr. exposes the water in round threads or Mr. Hancock in thin flat plates. re other essential differences between nd thinks the balance of advantage ir of Mr. Gurney's; might mention ; for one, Mr. Hancock's grate bars e burnt out in two or three trips, and they have been so destroyed. Cannot of the advantages in Mr. Hancock's hich are observable in Mr. Gurney's es not adopt the principles recom- by Mr. Gurney; thinks, indeed, hardly any thing common between Explains the points of difference: The form of Mr. Gurney's boiler n part cylindrical, is that which is nducive to strength; the form of Mr. k's is thin, flat plates, which is least ve to strength. Second, Every part Gurney's boiler which is exposed to on of the fire contains water in a state ilation, and is therefore not injured ue temperature. Considerable por- Mr. Hancock's boiler not containing ire exposed to the action of the fire, e therefore liable to destruction by temperature. Third, The probability osion in Mr. Hancock's boiler is in- in both the above cases. Fourth, ns are provided to separate the prim- m the steam in Mr. Hancock's boiler; arator *is intended* to produce this *Mr. Gurney's.* *Fifth,* Mr. Gurney avails himself of his waste steam to blow his fire; Mr. Hancock's blows his fire with a fanner worked by the engine, at the expense of a considerable portion of his power. Thinks those differences the probable causes of the failure of Mr. Hancock's carriage, and conducive to the success of Mr. Gurney's. Heard of an explosion of Mr. Hancock's boiler, and a man being killed by it. Never heard of any such accident occurring to Mr. Gurney's. There have been steam-carriages running between Paisley and Glasgow. There seems to be no popular objection to it there; on the contrary, they are always fully loaded. Is not aware of the principle upon which that carriage is built. Sir Charles Dance made a journey from London to Birmingham; the carriage had previously been running between London and Greenwich; has travelled more than once by it, to observe its performance; has heard that the separator was taken away from that boiler; thinks an accident occurred on the journey, beyond St. Alban's—a tube burst. The omission of the separator might have caused a tube to burst, if it produced a waste of water, so as to cause the boiler to boil dry. Has only heard of Mr. Hancock's within the last two or three years; inquires much after these things, and thinks that it would have come to his knowledge if it had existed in a practical shape before. Whatever credit may be due to Mr. Hancock, the priority is due to Mr. Gurney. Thinks there is nothing in Mr. Hancock's invention which exceeds in value Mr. Gurney's, but the reverse. Has published a work on the steam-engine, and written occasional essays in the Edinburgh Review. Has given particular attention to the subject of steam, and to practical science generally. Thinks the invention in question is as much in a state of advancement as inventions of this kind generally are, when they first come into practical use. It is as much, and perhaps more advanced, than the knowledge of steam navigation was when it was first practically applied. Of course experience would, from time to time, as is always the case, suggest improvements; but thinks the invention is now as far advanced as mere experimental carriages and engines are likely to carry it. Further improvement can only be obtained by experience on a much more extensive scale; such experience as a regularly established line of carriages alone would supply. Does not see the least public danger from their working; has not the least objection to travel on the engine himself. Has no doubt at all that it can be done with greater cheapness than with horses.

(To be concluded in our next.)

NOTES AND NOTICES.

Liverpool and Manchester Railway.—The annual general meeting of this Company was held on the 22d inst., Charles Lawrence, Esq., in the chair. The report of the proceedings of the last half-year, ending December 31, 1834, was read by the secretary, Mr. Henry Booth, which gave general satisfaction. A dividend of *4l. 10s.* per share was declared, payable on the 3d of next month,

Giant Cliffs of Fossil Shells.—At a late meeting of the Asiatic Society of Calcutta, some interesting extracts were read from letters received from Mr. Gerard, relative to the fossil shells collected by him in a late tour on the snowy mountains of the Thibet frontier. The loftiest altitude at which he picked up some of them, was on the crest of a pass elevated 17,000 feet. Generally, the rocks formed of these shells are at an altitude of 16,000 feet, and *one cliff was a mile in perpendicular height above the nearest level.* "Just before crossing the boundary of Ludak into Bassalier," says Mr. Gerard, "I was exceedingly gratified by the discovery of a bed of fossil oysters, clinging to the rock as if they were alive."—*Asiatic Register.*

Spontaneous Combustion.—A circumstance came to our knowledge a few days since, which, instead of throwing new light upon the subject of spontaneous combustion, involves it in greater mystery than ever. Mr. S. C. Staymaker, presented to Mr. Adam Reigart, of this city, a small piece of wood, evidently cedar, found in excavating the deep cut of the railway at the Gap, in this county, about 30 feet below the surface. This piece, weighing not more than two ounces, was broken in two, and laid upon a white pine shelf in Mr. Reigart's counting room. It was afterwards accidentally discovered that one of the pieces had ignited, and combustion was progressing so rapidly, that the shelf would in a few minutes have been on fire. On examination, a portion of one of the pieces was found reduced to ashes of a dark grey colour, and from some of the fibres being found, and ashes lodged in the interior under them, it would seem that combustion had commenced, not upon the outer part, nor upon the side which lay in contact with the shelf, but in the heart of the wood. The shelf was at least six feet from the floor, and so situated that no spark from a candle or lamp could have communicated with it; and on close examination, it is evident that the fire was not communicated externally.—*Lancaster* (Penn.) *Journal.*

The Cyanometer—Being at Paris, in July 1828, I applied to some of the most reputable philosophical instrument-makers for a cyanometer, but not one of them had any knowledge of it, or even knew there was such an instrument. I then called on Messrs. Gay Lussac, Cuvier, and Biot, for information respecting it. M. Gay Lussac told me that he considered the instrument of very little utility, and that it was found only in the works of Saussure, a young gentleman of extensive scientific acquirements, who, with an inventive genius, combined an untiring zeal for knowledge. He travelled extensively, and it was during his passage over the Alps, where, from the blue colour of the heavens, an idea occurred to him of constructing an instrument with degrees and attitudes marked to each of the blue shades, which should correspond with those in the heavens. "And," continued the sage philosopher, "Saussure is dead, and those only who have been at great heights, and retain a recollection of the colour, are capable of making a cyanometer."—*Chas. F. Durant, Professor Silliman's Journal.*

Progress of Knowledge.—Of old cobalt was thrown aside by miners as useless; they regarded *it as such an annoyance*, when found among the *ores, that there was a prayer* used in the German *church that God would* preserve miners from cobalt and evil spirits. The oxide of cobalt forms the most permanent blue colour with which we are acquainted; and the painter now, through knowledge, prizes that which the miner then, through ignorance, despised.—*Mrs. Grimstone—Mouth Repository.*

Dr. Church.—The attention of many persons was attracted on Saturday to Dr. Church's beautiful steam-engine, which was running on the Coventry road. The ground run over was 6 miles out and 6 home; and notwithstanding the roads were in the heaviest possible state, in one of the trips five milestones (i. e. three miles), were passed in nine minutes; and two milestones were passed in the extraordinary short space of two minutes and a half.—*Birmingham Gazette.*

Steam Expedition to the Euphrates.—The Geordie Canning, a barque, burthen 390 tons, has been engaged as a transport by Colonel Chisney to convey the expedition for navigating the Euphrates to Alexandria, and from thence, if necessary, to Bombay. The two iron steam-boats built by Messrs. Laird and Co., of Woodside, have been taken to pieces, and, together with a quantity of coals, form part of her cargo. Diving-bells, together with apparatus for blowing up sunken rocks, guns, ammunition, &c., to protect the expedition, have been provided. The party about to sail will consist of Colonel Chisney, as commander, Lieutenant Cleveland, R. N., three midshipmen, the surgeons, several artillery engineers, making altogether, including the crew of the boats, about 80 persons.—*Liverpool Journal.*

We expected to be able, by means of a Supplementary sheet, to find room for the whole of the Evidence on Mr. Gurney's case in the present Number; but are under the necessity of reserving about half-a-dozen pages of it for insertion in our next.

Mr. Mundy should consult Dr. Lardner's Treatise on Heat (Cab. Cyc.), one of the best works which has appeared on the subject. The heating power of good coal is to that of coke as 90 to 84, or to that of wood as 90 to 32.

We think very favourably of E. B.'s invention, but are afraid his drawing and description are not sufficiently clear for general comprehension. He will perhaps re-consider and revise them.

Communications received from Mr. Henderson—Rev. R. Carey—Mr. Vere—Messrs. Busk, Kay and Co.—C. W.—B. O. F.

The Supplement to Vol. XXI., with a Portrait on Steel, of the late Mr. Telford, continues on sale. Price *6d.*; also the Volume complete, in boards. Price *8s.*

☞ The Editor of the Mechanics' Magazine has made such arrangements as enable him to offer, on unusually advantageous terms, to undertake the solicitation of Patents for New Inventions, the drawing and revising of Specifications, and generally every other branch of Patent business. Drawings of Machines executed with accuracy and dispatch.

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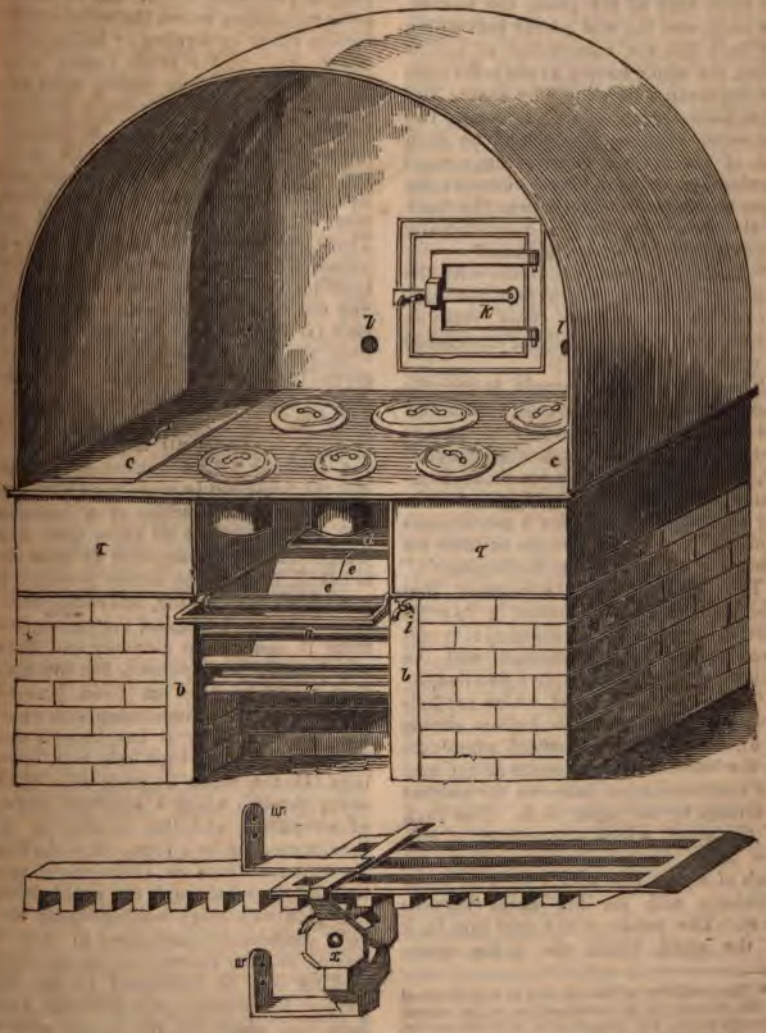
WEEKS'S PATENT COOKING APPARATUS.



WEEKS'S PATENT COOKING APPARATUS.

[Abstract of a paper by Mr. (John) Robertson, in Mr. Loudon's Architectural Magazine for Feb.]

"Mr. Weeks's improvement in the cooking range consists in taking the greatest possible advantage of a given quantity of fuel, so as to obtain the greatest extent of heated surface from the means allowed. To attain this end, the front bars of the grate, the cheeks, the back, and the end pieces into which the back fits, are constructed of hollow tubes, the whole having at the same time the appearance of a common grate; and pipes from these communicate with two hot water cisterns, one placed on each hob of the grate. There is also a communication between these cisterns by pipes passing horizontally over the back of the fire-place, so that a continually circulating medium is obtained.*

"There is an oven connected with the improved range, in which, from the manner of its construction, meat may be baked, and yet have all the advantage of meat that is roasted."

The writer then proceeds to describe and illustrate, by engravings, four different varieties of Mr. Weeks's apparatus:—1st, "a tradesman's kitchen-range;" 2d, "a cottager's or poor man's cooking-range;" 3d, "a kitchen-range or cooking apparatus suitable for a gentleman's family;" and 4th, "a range suitable for a hotel or club-house, or confectioner's."

The third of these varieties is that which exhibits the apparatus in its completest form;† the engraving of it is perfixed to our present abstract, and the following are the descriptive details:—

"The front bars (*a a*), which are hollow, communicate with hollow cheeks (*b b*), from the back of which pipes pass to the bottom of the cisterns (*c c*); and the communication between the cisterns is formed by the pipes (*d d*). The back of the grate, which is composed of hollow tubes, fits into hollow end pieces, each of which has also a pipe to communicate with the hot water cisterns (*c c*). The inside of the cast iron back of the grate, which the poker comes against in poking the fire, is nearly smooth, and the pipes are almost entirely on the outside. The surface of the range is covered with a cast iron plate, in which are placed five cast iron pans and a fish-kettle (of course the number of these pans may be increased), for stewing and for other culinary purposes. These vessels contain only boiling water, but tin vessels are placed in them, and in the cisterns containing water, the articles to be cooked either by stewing or boiling; the water, &c. in the inner vessels being made to boil by those vessels being surrounded by the boiling water in the outer vessels. This offers two advantages, namely, that the water in the tin vessels can never exceed the boiling point, and that these vessels, with their contents, may be easily and at once lifted out. There are two sheets of cast iron (*q q*) which slide in grooves, and are pushed together to keep the fire and heat from any one engaged at the stew-pans. The cock (*i*) for drawing the water off is fixed near the top of the range, so that the pipes can never be wholly emptied. Above the cast iron plate and pans is the oven. This is double cased, so that there is a vacuity all round, except at the doorway, for a current of hot air. But the principal improvement here consists in the introduction of a continual current of air. We all know that meat which is roasted is superior to meat that is baked, because the former is cooked in a continually changing, and consequently a purer atmosphere; and the exhalations from it pass up the chimney and otherwise into the atmosphere; but the meat that is confined in an oven becomes saturated with the impurities with which the air surrounding it has become contaminated. To obviate this evil, openings (*l l*) are made on each side of the oven, through which a constant current of air passes, and the exhalations are thus carried up by a funnel into the flue. From the cisterns on each side a pipe may be carried through the wall behind; this pipe will carry boiling water to a very considerable distance; so that by having another cistern beyond the wall, cooking may be performed by the mistress or housekeeper in a different room from that where the fire is, and whence the boiling water is supplied. Over the range there is a canopy of tin or zinc, to

* The similarity of this method to that followed by Mr. Gurney in the construction of his steam-carriage boiler, will immediately strike the reader.

† Mr. Gunter, the eminent confectioner, is said to be erecting a cooking apparatus after this model *at his private residence.*

prevent the steam ascending to the ceiling, at the top of which there is an opening for its escape into the flue."

"It is well-known that a false bottom to a grate causes a great saving in fuel, because the fire is by it brought in closer contact with the bottom of the pots or pans placed on the grate; but at times when roasting is to be done, the whole depth of the grate is required. In order to save the waste of fuel occasioned by neglecting to put in the false bottom when no roasting is wanted, and to obviate the inconvenience of having the fire deranged when roasting is required, Mr. Weeks's plan of a false bottom will be found effectual. Fig. 2 is a false bottom connected with the grate; *w w* are screwed on to the cheek; and by turning round the handle, which is put on the axle (*x*) of the wheel, the false bottom, which has a thin edge, will make its way forward through the fire, and may be drawn back at pleasure. The thin edge, when pushed forward, rests in a groove on the other end of the grate.

"The advantage and convenience of Mr. Weeks's cooking apparatus can only be fully appreciated by those who have seen it in use; and the great saving to the poor man, in the 'cottager's cooking apparatus,' by having two boilers and an oven heated without any additional fuel, and at the same time all the usual advantages of his fire-place, only requires to be known to be generally adopted."

MINUTES OF EVIDENCE ON MR. GOLDSWORTHY GURNEY'S CASE.

(Concluded from last Number.)

John M'Neill, Esq., C.E., examined.—Has always considered Mr. Gurney as the first person who really introduced steam-carriages on common roads. Believes this to be the general opinion among engineers as far as his experience extends; but is not so well acquainted with mechanical engineers, and those connected with steam-engines, as with that class who are principally employed in harbours, roads, bridges, and such works. Although Mr. Trevethick was previous to Mr. Gurney, his carriage was more applicable to rail-roads than to turnpike-roads. After trying it on turnpike-roads, and finding it did not succeed, he sent it at once to a railway at Merthyr Tydvil. Was examined *before the Committee on Steam-Carriages* in 1831; since that time has been in almost every carriage made for running on common roads. Has carefully examined the roads in the different parts of the country where steam-carriages have been running, as to the wear of iron in the shoes of horses, compared with the wear on the tire of the wheels of carriages, and is satisfied that the injury done to turnpike-roads would be much less by steam-carriages, in the event of their running over them, than that caused by mail and stage coaches drawn by horses; has not the least doubt in his mind, that if steam-carriages ran generally upon the turnpike-roads of the kingdom, one-half the annual expense of the repairs of these roads would be saved. If a steam-tug were attached to a steam-carriage, the eight wheels, under those circumstances, would be less injury to roads than the trampling of four horses. At the time the Committee sat in 1831, could speak to having seen only one carriage on a turnpike-road. From considerable experience since that period, is quite certain that in a very short time there would be no complaint of horses being frightened by steam-carriages. Has only seen one or two horses frightened by any of the steam-carriages he travelled with. Has passed many times through some of the most crowded streets in London and Birmingham in steam-carriages; has seen horses out in the morning led by grooms, which would in all probability be startled by any object which was at all likely to frighten a horse, and they did not take the least notice of the engine. At another time, several ladies passed on horseback without the least alarm, and some of them rode close after the carriage, and alongside of it, as long as they could keep up with it. This was Mr. Gurney's steam-carriage; has also witnessed the same results in Mr. Hancock's carriage and in Colonel Macerone's. Thinks steam-carriages run with perfect safety to the passengers, indeed, with greater safety than the fast coaches drawn by four horses. Thinks they could be run with greater cheapness, but cannot say so from experience; has made a calculation which is decidedly in favour of steam-carriages. There has been a Company established for the purpose of improving the present road, and running steam-carriages between London and Birmingham, of which Company witness is the engineer. Is at present with a few other persons engaged in building a steam-carriage. A number of engineers and other persons (of which party witness was one) who went in Sir Charles Dance's carriage (the one which he purchased from Mr. Gurney), as far as Stony Stratford, were so convinced of the practicability of running steam-carriages on turnpike-roads, that they

entered into an agreement amongst themselves to build one. Mr. Donkin, Mr. Cubitt, and witness, were appointed to take the management of it. It is being built by Messrs. Maudsley and Field; the boiler is one for which Sir Charles and Mr. Field have taken out a patent; it is different from Mr. Gurney's, otherwise a patent could not have been taken out; entered into no contract with Mr. Gurney for the use of his boiler; understands that Sir Charles is in possession of Mr. Gurney's patent and carriage. Believes the great difference between Messrs. Maudsley and Field's boiler and Mr. Gurney's is, that there is no separator; but does not know whether that constitutes the ground of the patent which Sir Charles and Mr. Field have taken out. Should not like to give an opinion as to the best boiler to be employed in steam-carriages, but is quite sure that there is no danger to be apprehended from any he has seen in use. Thinks decidedly that there will be no danger with the boiler making by witness and others. Mr. Field, who has been long practised in works of this description, has stated that there would be no danger, and looks upon him as the best authority in the kingdom. Is not sufficiently acquainted with the subject, to say whether the separator in Mr. Gurney's boiler is substantially necessary; but thinks the fact of Mr. Field excluding it, a strong presumption that it is not. Thinks one cause why the science of travelling on roads by carriages propelled by steam has made so little progress from the time they were first made to the present time, is, that the bill which was brought into Parliament to give steam-carriages the right for a certain fixed toll to pass all turnpike-gates, did not pass into a law. Has had a good deal of conversation with Mr. Heaton, of Birmingham, upon the subject, and understood from him that the uncertainty with respect to the tolls, was a very great drawback to persons interested in bringing forward steam-carriages. Mr. Heaton has, along with his brethren, taken out a patent for a steam-carriage on a new principle to run in the neighbourhood of Birmingham, and has commenced building carriages under his patent. There were several Road Acts at that time about Birmingham which were proposed to be renewed, and in one or two instances there was a toll put on steam-carriages. Does not recollect what it was, but Mr. Heaton complained exceedingly of it, and he looked principally to the roads in the neighbourhood of Birmingham for running carriages, and he was afraid of the prospective tolls being injurious to him. Thinks Mr. Heaton was more connected with the local than general inconvenience; believes, also, that he thought there would be a general fixed toll upon all steam-carriages; this have an influence on all persons who be likely to undertake the running of s carriages on common roads. Has not the fact of any instance where a person, attention had been directed to the s failed from prosecuting those inquiri the amount of toll which has been pla all the roads. The feeling of the pu favour of steam-carriages, has altered within a few years; every one, almost, favourable to them. Thinks that not a hundred is against them, and those o to them are generally interested p The persons who have continued the periments in steam-carriages on the r are, Mr. Hancock, Dr. Church, Sha Roberts of Manchester, Colonel Ma Heaton at Birmingham, Russell in Gl Ogle, Sir Charles Dance, and Maudsl Field in London. Maudsley and Fiel attempted one, independent of Sir C Dance, Of these there were engaged subject when witness was examined in Messrs. Gurney, Hancock, Church, Sir Charles Dance, and Colonel Ma Thinks that Mr. Hancock was the on who ran for hire at that time. Mr. H did not give up in consequence of th but spoke of them as a great hardsh as one likely to prevent persons enteri a speculation with his steam-carriage. did not, however, effect the discontinu his steam-carriage, because there was pany formed soon after, which took scheme, with a capital of 10,000*l.*; entered into an agreement with those to build carriages for 500*l.* a-piece, certain distances, He did build carria the Company, and one ran for a short d in the neighbourhood of Birmingha merely once or twice for experiment not know why it was given up. Th Mr. Heaton built on his own accou running for several months; travelle it on some of the steep hills about Bi ham. Mr. Heaton's carriage had no c ion with Mr. Gurney's principle; it h same boiler as used in the locomotive-ca on the Manchester and Liverpool Ra the tubes were surrounded by water, a fire passed through them. Has no c tion with Sir Charles Dance further th companying him to see the performa his carriage: has gone with him to wich several times—to Norwood, and down most of the hills in that neig hood. Was not with him at the Glo and Cheltenham experiment, but as stated, went to Stony Stratford with professional engineers and other person of whom, from previously thinking th quite visionary, became satisfied of the

it would be to the country—although it was not so successful an experiment as some preceding ones. The same boiler was used as that in the experiments to Greenwich, Norwood, and Brixton; it was not Mr. Gurney's original boiler, there was no separator; the tubes were about one inch wide, and thinks it was different in other respects. Thinks the experiment should be considered as Sir Charles's alone. The roads were exceedingly bad upon that occasion. Can show from experiments made with an instrument constructed to ascertain the draught of carriages on roads, that on that day the power required to propel a carriage upon some parts of the road was at least three times as much as in a fair average state. Sir Charles's trip to Brighton, and those to Greenwich and Norwood, were very successful. Believes he deviated from Mr. Gurney's principle previous to those experiments, and that there was no separator. As to those persons who have tried experiments on steam-carriages, some are very close copies of Mr. Gurney's invention; thinks Mr. Hancock's very little removed from it, but that it is not so safe as Mr. Gurney's, because flat chambers cannot be so strong as tubular ones. Thinks that to a certain extent Mr. Ogle's is also similar to Mr. Gurney's, because the separation of the water into small portions, in this apparatus, is very like the great improvement Mr. Gurney made. Thinks that Dr. Church's, too, differs very little from Mr. Ogle's; is not at all acquainted with Mr. Gibbs's; has no knowledge of Sharp's and Roberts's; thinks Colonel Macerone's nearly the same as Mr. Ogle's; believes he has a receiver, but is not certain as to a separator; Sir Charles Dance's is, in some respects, the same as Gurney's; Mr. Maudsley's is more on the arrangement of Trevethick; he has concentric cylinders. These are all tubular boilers, and divide the water into small portions, and so far resemble Mr. Gurney's; thinks they are not improvements. Mr. Hancock is the only one running for profit; is informed that he intends running four carriages on the Paddington-road. Thinks a toll of 2*d.* a trip would have little effect; but 4*s.* or 5*s.* would most likely stop him. Considers the general opinion throughout the country now to be, that although prohibitory tolls have been imposed on certain trusts, the Legislature will not impose any more prohibitory tolls; and has had occasion, when, upon the business of the Holyhead-road, and the Birmingham and London Steam-carriage Company, frequently to see the trustees all along that line of road, and on every meeting they gave their full approbation to the principles of a bill for running steam-carriages on the roads of which they had the management. Has been applied to by parties to examine the line of road from London to Bath, for the purpose of establishing another Company, by very influential people upon that line of road. The public are now more convinced of the success of steam-carriages, and the opinion is spreading that they will be a benefit to the country generally. The large proprietors of land, who formerly conceived that the introduction of steam carriages in doing away with horse labour, would be injurious to the landed interest, have quite changed their opinion, and they now believe the country generally would be benefitted by the introduction of steam-carriages. The Company to which witness was engineer, proposed to introduce a Bill into Parliament, charging a certain toll on steam-carriages passing over the road; but that toll would not be more than would be required for the purpose of paying for the repairs of the road, and the interest of a certain sum laid out in the improvement of it—about the same as charged on mail, or other four horse coaches, the passengers being limited to twenty-five. Mr. Hancock has built a carriage for some merchants in Germany,—and those persons engaged running omnibusses, have agreed to take steam-carriages for the Paddington-road. Was out with Mr. Maudsley in his steam-carriage, when a gentleman who keeps between 300 and 400 horses on turnpike-roads, was so struck with the facility with which the steam-carriage passed all other carriages, and cleared all corners of streets, &c., that he expressed his thorough conviction of the practicability of the scheme, and stated that as soon as steam-carriages could be had, he would become a proprietor. Thinks that if Mr. Gurney's patent were thrown open, there would be many new carriages commenced that are not now thought of. Conceives it would be a great advantage to the public if Mr. Gurney's patent were thrown open. Believes all the steam-carriages safe enough to the public, but that they would be brought much sooner into general use if Mr. Gurney's patent were thrown open, because then every person could avail himself of the advantage which has been gained by Mr. Gurney's experience. Is persuaded several have put themselves to great trouble to avoid infringing Mr. Gurney's patent. Thinks travelling could be carried on at less than half the present prices, and probably obviate the necessity of railways in certain districts where quick travelling is of consequence. Steam-coaches, at the rate of fifteen miles an hour, would be safer than horse-coaches at ten or eleven. On going down hill, the leading horses are perfectly useless, and frequently get in the way of the wheel horses; they give the coachman much trouble, and frequently cause serious accidents by the traces getting loose; there

have been accidents between London and Birmingham, which, if steam-carriages had been introduced, would not have taken place at the increased speed of sixteen or seventeen miles an hour. At the end of the last Report on Steam-carriages, there were two or three tables affixed to it, and some answers given, in which a machine of witness's was spoken of, as determining the power necessary to propel carriages on different roads, and on various inclinations; has made additional experiments, and has committed the results to paper.

[*The same was handed in and read, as follows.*]

"By a considerable number of experiments on roads of different kinds, the draught of carriages was found to agree very nearly with the results calculated from the empyrical formula."

$$P=\frac{W'+w}{93}+\frac{w}{40}+C.V.$$

In which W'=the weight of the waggon;
w=the load;
C=a constant number, which will depend on the surface over which the waggon is drawn; and
V=the velocity in feet per second.

By putting V=3.7, which was the velocity used in the experiments, the constant number C was found to be equal to 2 for a timber surface.

For other surfaces the value of C may be taken as follows:—

On a paved road=2.

On a well-made broken stone road in a dry state=5.

On the same road covered with dust=8.

On the same road, wet and covered with mud=10.

On a gravel or flint road, when wet=13.

On the same road, very wet and covered with mud=32.

On an inclined plane the above formula becomes $P=\frac{W'+w}{93}+\frac{w}{40}+C.V.+\frac{h.}{l}\frac{W'+w}{I}$ for a common stage-waggon; and

$P=\frac{W'+w}{100}+\frac{w}{40}+C.V.\pm\frac{h.}{l}\frac{W'+w}{I}$ for a stage-coach.

The following experiments were made in presence of the Duke of Richmond and Sir H. Parnell, with the Road Indicator, or instrument for ascertaining the force necessary to *draw a carriage over* different kinds of roads *and pavements*, and consequently the actual *condition of the road*, May 18, 1833:—

1st Trial 34 lbs.	2d Trial 30 lbs.
38	34
35	37
31	38
36	39
37	40
36	41
38	36
37	31
38	39
40	32
39	31
31	27
29	30
29	30
26	28
22	24
23	20
14	15
18	20
18	20
20	22
22)670(30.454 lbs.	22)664(30.181
66	66
100	40
88	22
120	180
110	176
100	40

"The place of trial was in the Re Park, and the space passed over durin experiment was 220 yards of gravel the average draught in the first expe was 30.454lbs., that in the second tri 30.1811bs., making a difference of .2 or little more than ½lb. in the dista one furlong, which shows the accurac which the instrument works, and quently with what precision the st condition of any road may be determi it, as well as the law of resistance aff the draught of carriages at different cities."

Witness has not compared these e ments with steam, for the obvious r that there has not been a sufficient n of experiments yet made with steam ages to justify a comparison. Upon roads, has it exactly; but this would n ply to turnpike-roads. As soon as Mar and Field have completed their carria tends to investigate the subject, and accurate tables of the comparative expe working carriages on railways and turn roads, by steam and horse power. T steam power favourable at all velocities four miles an hour; with great adva at 16 or 17 miles, and this in the sun on the roads as they now exist, but in w it would be necessary to harden the roa some means; granite tracks are one but there is another, which witness doe wish to mention. Mr. Russell, of Gla is now running between Paisley and gow; believes there are no prohibitor on that road. Does not think that t

lic would have preferred Hancock's to Gurney's, had it been previously running, for the reason that they would not at first like to be upon a carriage carrying the engine and boilers, if there was one, like Gurney's, drawing the carriage and passengers after it. Thinks Gurney's safer than Hancock's,—though there is not much danger in either. Thinks the prohibitory tolls were a great injury to Mr. Gurney, but that it is only matter of opinion, as to whether the tolls made the contractors give up their contracts. Thinks if Mr. Gurney had not been deterred, steam-carriages would have been in operation on the main roads of England. If Mr. Hancock, or any body else, had been in Mr. Gurney's situation with respect to tolls, and contracts made with him, thinks he would not have persevered under those circumstances as he is now going on; but if he had a very large capital he might not have been deterred, though there was quite enough to deter persons looking for remuneration. Thinks a re-action has taken place in the public mind decidedly favourable to steam-carriages on common roads.

Alexander Gordon, Esq., C. E., further examined.—Was in conversation with several monied gentlemen of the city, in 1831, who proposed to form themselves into a company, but in consequence of Sir Charles's stoppage from the tolls, they would not proceed. Thinks engineers, as a body, not the best persons to introduce the subject, because they bring their old rules to bear upon a new subject. Mr. Gurney's points of circulation and separation are not admitted by engineers at all; with few exceptions, they are all inclined to introduce boilers of a large capacity, which are liable to accidents from bursting. A boiler without a separator, if made of small chambers, may be safe; but if the chambers are increased in size, and not circular, they are apt to burst. Thinks the accident to Hancock's boiler arose from the want of a separator. A separator, or mode of separation, is absolutely necessary to every boiler. The following is the best illustration of this witness can offer:—Intensely heated water is similar to soda water in a bottle; the steam is held in solution by the water, just as carbonic acid (gas) is held in solution in soda water; apply a warm hand to the bottle, and start the cork, and you may (even when you keep the bottle in a vertical position) drive all the liquid out in froth. The same thing happens in a boiler of small capacity, if separation be not attended to. As to whether Hancock's could stand a competition with Gurney's, does not entertain so good an opinion of Hancock's, as a *mechanical structure*, as Gurney's. *Does not think* Hancock's in any *way a modification of* Gurney's patent.—It is the prevailing opinion with engineers, that there must be a certain surface of boiler for the transmission of heat to the water for every horse power—thinks that in Bolton and Watts it is 16 or 17 square feet, and they allow 25 feet of space per horse power. In high-pressure engines it is about 9 or 10 feet per horse power. Mr. Gurney produced the same effect by intense heat on a smaller surface, and the smallness of his chambers enabling him to use thinner metal, the more rapid transmission of heat has enabled him to introduce the lightest boiler yet invented; believes that with a hundred weight of boiler, he will evaporate more water than any other person can do, with as great safety, by any other means. Thinks that without Mr. Gurney's invention, steam-carriages would have been in the same state as he found them in. The question as to whether Mr. Hancock's boiler is on the same principle as Mr. Gurney's, involves the consideration of the specification. Mr. Hancock has certainly the facility of transmitting a certain quantity of heat through a small surface, but he has not arrived at it by the same form as Mr. Gurney's patent.* Thinks that in any legislative enactment, a clause should be introduced to prevent large chambered boilers being used in crowded thoroughfares; and that even Mr. Gurney should be limited in the size of his separator. Mr. Farey, a good authority, in 1831, stated before the Committee that no accident could happen with Hancock's; now a fatal accident has happened. Should not like Mr. Gurney's chambers being much larger than they are now. Mr. Roberts, decidedly one of the best mechanics in Europe lately built a steam-carriage with a large chambered boiler, and after it had ran a few miles, it blew up in the streets of Manchester. That no accident has happened upon the Liverpool and Manchester Railway from the large boilers that are there used, must be attributed to the structure of the flue tubes, which burst and let out the water. These flue tubes do, in fact, act as so many safety valves. The Directors complain very much of the expense of repairing them, and every means for strengthening them, and rendering them more durable is resorted to; and they may go on strengthening them so much tha they cannot burst, and then an acciden from the sides of the boiler may be looked for. Steam-engines on railroads do not require so great a variation of pressure as upon common roads. Mr. Russell, of Glasgow, who was appointed to lecture from Professor Leslie's chair after Sir John Leslie died, and until a new Professor was elected,

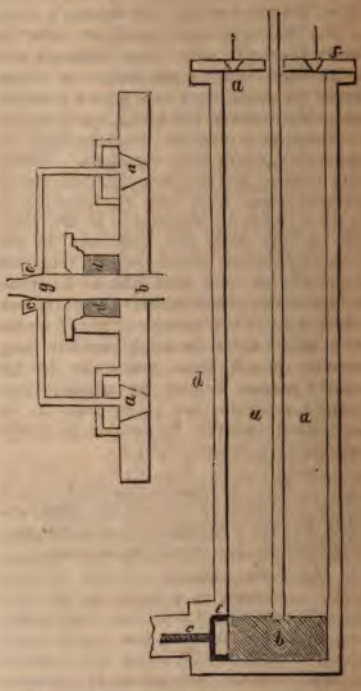
* Both Gurney's and Hancock's patents were taken out in 1825.—See evidence of Mr. Poole, post. p. 328.

wrote an article upon the subject of Inland Transport, in the Foreign Quarterly Review, stating that nothing had been yet done in steam-carriage conveyance, and that every attempt hitherto had totally failed; and then he began upon a new plan of his own. Few practical men gave him any great credit for understanding the subject upon which he wrote at that time. He stated springs as very essential; has never seen any of Mr. Gurney's carriages without springs. Dr. Church's carriage has a very defective boiler; it is altogether too large a machine to run on a turnpike-road, it is more like a large and wide van than an ordinary carriage. Mr. Heaton had advantages from the neighbourhood of Birmingham being one where machinery is favourably regarded, and such as no one could have about London or Cheltenham. There are two carriages building at Maudsley and Field's factory; one upon Mr. Joseph Maudsley's plan, and the other on Mr. Field's and Sir Charles Dance's. Mr. Maudsley's boiler consists of several cylinders, of water and flue space alternately. Mr. Field's and Sir Charles's is a modification of Mr. Gurney's, without the separators. In Mr. Gibbs's carriage the circulation is very imperfect, and there is a liability to burn out the top of his fire-place. As to the change in public opinion with respect to Mr. Gurney's carriage, this has arisen from the great advantages which must result to society from the introduction of steam-carriages upon turnpike-roads cheapening and accelerating conveyance by non-consumers of food, being made more apparent. He doubts not Mr. Gurney as the demonstrator of steam-carriage practicability will therefore be favourably regarded, but does not think his name has any thing to do with the change in the moral feeling of the country. Is of opinion that the experiments that have lately taken place, or may now be taking place, with respect to steam-carriages, are no proof that sufficient obstacles did not exist to Mr. Gurney's going on in 1831.

Mr. William Poole, of the Patent Office, examined.—The date of Mr. Gurney's first patent for steam-carriages is the 14th May, 1825; the second, October 21st, 1825; the third, October 11, 1827. The date of Mr. Hancock's patent is 1825. Dr. Church's two patents, one in 1831, and another in 1833. Has not the date of Messrs. Sharpe and Roberts. Colonel Macerone's, 18th July, 1833. Heaton's, 23d Nov. 1830. Russel's patent has just passed (July 1834). Summers and Ogle's, 14th April, 1831. Sir Charles Dance's patent, in his own name, 21st Feb. 1833. Maudsley's, 7th Oct. 1833. *Gibbs's, 25th Sept.* 1832. The expense of a *patent for England*, Ireland and Scotland, *is three hundred* and sixty pounds.

IMPROVED SINGLE-VALVED AIR-PUMP.

Fig. 2. Fig. 1.



Sir,—I am induced to trouble you with a sketch and description, of what I think an improvement in the single-valved air-pump. The *principal* improvement, I think, consists in providing a means of escape for the air which always remains *below* the piston, in pumps of the old construction. As to the mode of lifting the valve or valves (for either one or two may be used), I know not whether it is even any thing new, much less an improvement.

Fig. 1, *a a*, represents the barrel of the pump; *b* a solid piston, ground so as to be perfectly flat; *d* the bottom of the pump also made flat; *c* passage to receiver divided into two branches, so that when the piston touches the bottom of the cylinder, the upper passage *e* may be close above the piston; *f* the cap, through which the piston rod must slide air-tight by means of a stuffing-box.

Fig. 2 represents the cap, valves, &c., at large; *a a* are the valves, connected by the part *c c*, through which the pis-

must slide tightly by means of
-box.

be observed that the piston rod
naller diameter above *g*.

node of action will be obvious.
n *b* (fig. 1,) after it has passed
ing *e* in its descent, will force
beneath it through the lower
either back into the receiver, or
pump, instead of having to over-
elasticity, as heretofore. The
ll then ascend, carrying with it
ir above *e*; the moment it has
the valves *a a* (fig. 2,) will be
the friction of the piston rod *b*
n the stuffing-box *c*. The reason
asing the size of the rod above
s:—the piston *b* (fig. 1,) may
fore the valves *a a* begin to rise,
a communication would be
etween *e* and the external air.
escent of the piston the valves *a a*
d by the friction of the rod in the
box as before. I think this pump
y the exhaustion of the air very
it is tolerably simple. I shall be
t only suggest still further im-
nts in this useful instrument;

nd remain, Sir,

Yours very respectfully,

N. C.

HALL'S STEAM-ENGINE IMPROVEMENTS.

Let us see how the question, if
it be, stands between Messrs.
ite and myself.

. 586 of the Mech. Mag. you
d a paper on "Mr. Hall's Steam-
mprovements." In this paper,
ther testimonials in Mr. Hall's
ppears a Report from Captain
o the Company under which he
ds, commending Mr. Hall's im-
nts. Captain Martin says, "I
r you to Mr. Braithwaite, who
board several times, and de-
with the action of the vessel in a
and opposing wind."

pon Mr. John Braithwaite not
avows the delight imputed to
denies the originality of the
of Mr. Hall's apparatus, and
in a few weeks to endeavour to
to the public, and push the mat-
further by obtaining what has
been accomplished upon this
namely, a nearly perfect va-
cuum. (See Mech. Mag., No. 597.) Furthermore, Captain Martin alone, if any one, being to blame for the using of Mr. Braithwaite's name, Mr. Braithwaite attacks, without mercy, Mr. Hall's inventions.

Wishing to spare my friend useless trouble, I venture to state my views of the proper business of patentees, avowing, at the same time, the melancholy truth that I belong to the legal profession. Then comes down upon me Mr. William Braithwaite, who treats me as if I were an Old Bailey practitioner.

The Messrs. Braithwaite are such respectable men that I shall not easily be induced to quarrel with them. I shall, therefore, in a good-humoured way, reply to Mr. William Braithwaite's not very good-humoured letter.

I thought Mr. John Braithwaite was sufficiently well known to prevent the possibility of its being supposed I included him in the body of those that Mr. William Braithwaite terms "fishing speculators"—a flock that have pecked at Mr. Hall in a very troublesome manner. However, Mr. William Braithwaite picked up the cap, and dropped it on his brother's head; and you have very carefully patted it down. Whether Mr. John Braithwaite will thank you both, I know not—nor whether the cap fits—at all events, I shall take no trouble to remove it.*

Of course Mr. Braithwaite would refuse to take a license from Mr. Hall for that to which he might think he had a prior claim; but what in the world has that to do with Captain Martin's report? And does Mr. William Braithwaite think Mr. Hall had any thing to do with Captain Martin's report? or that Captain Martin would report to his own Company contrary to facts? And does he think that the superintendents of steam-machinery under the Admiralty, and the Liverpool Company, and the long list of engineers who have taken licenses, are all wrong, and his brother, alone, right?

* We must wholly disclaim the part ascribed to us in this paragraph; and think it only fair to Mr. Wm. Braithwaite to add, that there appears to us to be just as little ground for the fling at him as for that at ourselves. The *real* facts are these:—Mr. William Braithwaite tossed back indignantly the cap too surely intended for his brother (Mr. Rosser's affected disclaimer notwithstanding); and we did but certify (being appealed to) that Mr. William Braithwaite did well in so doing.—ED. M. M.

Once more, I will get into no quarrel on the subject. Mr. John Braithwaite would have done better in not attacking Mr. Hall. He might have been content simply to state that Captain Martin had misapprehended him; and, afterwards, to prove, by the production of whatever he had projected, his own originality, and Mr. Hall's inferiority.

I am, Sir,
Your obliged servant,
ARCHIBALD ROSSER.

New Boswell-court, Lincoln's-inn,
January 31, 1835.

[We are not sure that we do right in inserting this letter—for though it does credit, as a piece of special pleading, to the professional skill of the writer, it does not meet as it should have done the points at issue, but leaves them exactly where they were. Of what consequence is it to the public how Mr. Braithwaite came to deny the correctness of Captain Martin's statement of the performance of Mr. Hall's apparatus on board of the City of London? Is it not sufficient that the denial has been made? Mr. Rosser talks of sparing his client "useless trouble." But can any trouble be deemed "useless," which is necessary to the elucidation of the truth, respecting a matter of, confessedly, some public importance? Neither Captain Martin, nor Mr. Hall, can reasonably expect that a matter of this sort is to be settled by intervention of attorney. Mr. Rosser asks Mr. William Braithwaite, whether he thinks "Captain Martin would report to his own Company contrary to facts?" and we dare say Mr. William Braithwaite will be prepared to ask Mr. Rosser in return, whether he thinks "Mr. John Braithwaite would publish to the world any thing but facts in contradiction to Captain Martin?" Such modes of *begging the question* decide nothing. What the public (for whom we speak) desire to know is how the facts really are, independently of the persons concerned, and of all personal considerations.—ED. M. M.]

LIVERPOOL AND MANCHESTER RAILWAY.

We have great pleasure in laying before our readers a complete copy of the Report made by the Directors of this Railway to their constituents at their last half-yearly meeting (the sixth), on the 22d of January last, when, as stated in our last, a dividend of 4*l.* 10*s.* per share (for the half year) was declared. It furnishes another most complete answer to the calumnies of Mr. Cort and his patrons; showing that, after paying all expenses ("interest" on loans included) during the past half-year, there remained a nett balance of profit of 40,346*l.* 6*s.* 7*d.* The Directors, it will be observed, have resolved to discontinue the practice which they have hitherto followed, "of publishing minute particulars of the traffic, with detailed subdivisions and classifications of the disbursements." The practice was a good one, and we are sorry that it has been departed from. The hit at the "Navigation Companies," for not furnishing "their quota to the general stock" of statistical information on the subject of inland transports, is very fair; but the more these bodies are to blame in this respect, the more it would have been to the honour of the Liverpool and Manchester Railway Directors to persevere in the patriotic and enlightened course they at first adopted, of laying the fullest possible information on every branch of their proceedings before the public.—ED. M. M.

LIVERPOOL AND MANCHESTER RAILWAY—SIXTH HALF-YEARLY MEETING.

REPORT.

Liverpool, January 21, 1835.

The Directors are happy to inform the Proprietors that the business of the Company in the last half-year appears to have been gradually on the increase compared with that of the corresponding six months in former years. The following is a statement of the receipts in the different departments, and of the disbursements, exhibited under the usual heads for the same period:—

HALF-YEAR ENDING 31st DECEMBER, 1834.

Receipts.

Coaching Department	£60,292	7	4
Merchandise do	41,197	18	6
Coal do	3,408	16	4
	£104,899	2	2

Brought forward £104,899 2 2

Expenses.

Bad Debt..... Account	£292	2	6
Coach Disbursement .. do. viz., guards and porters' wages, £1,205 3*s.* 3*d.*; parcel carts, horsekeep and drivers' wages, £365 10*s.* 2*d.*; materials for repairing, £1,131 16*s.* 11*d*; men's wages repairing, £1,505 7*s.* 5*d.*; gas, oil, tallow, cordage, &c. £155 11*s.* 3*d.*; duty on passengers, £3,284 12*s.*; stationery and petty expenses, £308 19*s.* 1*d.*; taxes, insurance, &c., on offices and stations, £171 16*s.* 1*d*.....	8,128	16	2
Carrying Disbursement Account, viz., agents and clerks' salaries, £1,804 12*s.* 9*d.*; porters and brakesmen's wages, £5,028 14*s.* 8*d.*; gas, oil, tallow, cordage, &c., £208 3*s.* 5*d.*; repairs to jiggers, trucks, stations, &c., £681 4*s.* 9*d.*; stationery & petty expenses, £487 15*s.* 9*d.*; taxes, insurance, &c., on offices and stations, £451 8*s.* 8*d.*	8,562	0	0
Coal Disbursement Account	220	1	8
Cartage (Liverpool) .... do.	59	16	8
Do. (Manchester) .. do.	3,247	2	3
Charge for Direction .. do.	301	7	0
Compensation (Coaching) do.	43	1	11
Compensation (Carrying) do.	222	19	8
Coach-office Establishment do., viz., agents and clerks' salaries, £601 15*s.*; rent and taxes, £74 10*s.*	676	5	0
Engineering Department Account	352	10	0
Interest .. .. do.	6,725	14	5
Locomotive Power ..... do. viz., coke and carting, £3,654 7*s.* 5*d.*; wages to coke fillers and watering engines, £349 15*s.* 10*d.*; gas, oil, tallow, hemp, &c., £932 8*s.* 10*d.*; copper, brass, iron, timber, &c., for repairs, £3,295 19*s.* 9*d.*; men's wages repairing, £4,892 3*s.* 2*d.*; enginemen and firemen's wages, £815 12*s.* 7*d.*; out-door repairs to engines, £1,320 3*s.* 1*d.*; three new engines, £2,880 13*s.*; new boiler and shed at water station, £223 8*s.* 11*d*.....	18,364	12	7
Law Disbursement Account	100	0	0
Maintenance of Way do., viz., wages and small materials, £4,163 0*s.* 10*d.*; stone blocks, sleepers, &c., £1,082 10*s.* 4*d.*; new rails, chairs, points, crossings, &c., £2,500 11*s.* 3*d.*; ballast and leading, £217 6*s.* 5*d.*	7,963	8	10
Office Establishment Account, viz., salaries, £767; rent and taxes, £70 10*s.*; stationery, &c., £49 11*s.* 1*d.*	887	1	1
Police ..... Account	1,033	4	4
Petty Disbursement do.	40	0	0
Rent..... do.	233	15	0
Repairs to Walls and Fences do.	712	9	9
Stationary Engine Disbursement Account, viz., coal, £303 16*s.* 3*d.*; engineman and firemen's wages, £102 6*s.*; materials and repairing, £63 9*s.* 9*d.*; gas, oil, tallow, &c., £53 15*s.* 5*d.*; deepening engine wells, £44 2*s.* 6*d.*	567	9	11
Tunnel Disbursement Account, viz., brakesmen's wages, £226 3*s.*; gas and repairs, £91 19*s.* 8*d.*; new sheeves, oil, cordage, &c., £90 14*s.* 4*d*.....	408	17	0
Tax and Rate Account	2,729	17	6
Waggon Disbursement do., smiths' and joiners' wages, £1,207 11*s.* 10*d.*, steel, iron, timber, &c., £1,322 10*s.* 10*d.*; cordage, grease, paint, oil, &c., £149 19*s.* 8*d.*	2,680	2	4
			64,552 15 7

Nett Profit for Six Months £40,348 6 7

STATEMENT OF RECEIPTS AND EXPENDITURE ON CAPITAL ACCOUNT,

From the Commencement of the Undertaking to 31st December, 1834.

Treasurer, *Dr.*	£	s.	d.
To Amount of joint Capital in Shares and Loans	1,151,185	0	0
Ditto of Dividends not paid ..	1,426	17	5
Ditto of Reserved Fund and Interest	3,930	13	6
Surplus in hand after payment of the 8th Dividend in August, 1834	164	11	0
Nett Profits of the Concern for the half year ending 31st December, 1834	40,346	6	7
	£1,197,053	8	6

Treasurer, *Cr.*	£	s.	d.
By Amount of Expenditure on the Construction of the Way and the Works, including the Tunnel Excavations, &c., now in progress	1,156,563	18	3
Ditto in the hands of Moss and Co., Bankers	23,790	14	6
Ditto in the hands of the Treasurer	117	4	8
Ditto Arrears of Calls	18	8	6
Ditto Balance of Book Debts due to the Company	16,563	2	7
	£1,197,053	8	6

On the subject of the accustomed half-yearly Reports, the Directors beg leave to recommend to the proprietors a departure from the plan hitherto pursued of publishing minute particulars of the traffic, with detailed subdivisions and classifications of the disbursements; and in doing so, they will state briefly some of the reasons which have led them to this recommendation.

The Liverpool and Manchester Railway being the first great undertaking of the kind, the Directors, on the opening of the line, were aware that according to the measure of its success would be the probability of similar enterprises, founded on this first experiment; every step, therefore, in their proceedings, whether with reference to extent of traffic, mechanical improvements, or financial results, was intereresting, as well to the public as to the proprietors; and under that conviction the Directors published, half-yearly, those minute details of the concern, which have found their way into every portion of the globe. It was obvious also, that had their example in this respect been followed by the conductors of the great Water Conveyances, so far at least as regards the extent and gradual increase of their aggregate traffic, whether comprising raw materials, moving from the sea-port into the interior, or manufactured commodities brought from the country to the port for shipment, valuable statistical information might have been obtained.

During four years the Directors have pursued the plan of unreserved publicity; their difficulties and their mistakes, but notwithstanding these—their success in the great features of their undertaking, have been made familiar to the public. The subject is now understood in all its parts, and so well satisfied are the public and the legislature with the general result, that the construction of railways in great lines from north to south of the kingdom, has become a distinguishing mark of the present age. The object of publicity has thus been gained. It has been determined by the country and the Government that railways shall proceed; and the extent to which they will hereafter be carried will depend on the success, not of the Liverpool and Manchester line, but of those great works which are now in progress. The Directors are of opinion, therefore, that the time is come when they may fairly be allowed to consult the interest and convenience of the Railway Company, regarded as a great mercantile concern, whose proceedings may henceforward be considered as matters of business, in which the proprietors alone are concerned. It is obvious that no statistical information can be expected from the publication of their accounts, as none of the Navigation Companies, the great rivals and competitors of the Railway, will furnish their quota to the general stock. Such existing railways also as have up to the present period been completed, have forborne to furnish any detailed statements of account; and the Directors are not aware that the conductors of the great north and south lines, now in course of execution, intend to deviate from the general rule; neither, perhaps, should it be considered matter of surprise, that the managers of other concerns, regarding the conduct of their several undertakings, exclusively *in the way of business*, and with a view to the commercial interests of their respective proprietors, should decline exposing gratuitously the extent and character of their operations, and the exact increase or decrease of their traffic, with its corresponding profit or loss, to the examination of rival or opposing establishments.

On the subject of locomotive power, the Directors have again to observe, that they consider *the travelling engines* to be in a state of gradual but marked improvement. The superintending mechanics of the Company, by lengthened experience, unremitting attention, and constant examination of the working of the various engines, have endeavoured to add some improvement to each machine as it has passed successively through their hands. And the

Directors feel no hesitation in stating, that the trips of the locomotive engines, for the last six months, have been performed with a speed and regularity superior to what has been accomplished in any former period. The disbursements in this department for the last six months are heavy, but they include the cost of three new and powerful engines, and the entire re-construction with new materials of a fourth, with the exception only of the cylindrical boiler. Whilst alterations were continually making, and improvements suggested, the Directors were unwilling to have on hand a large stock of imperfect machines: they are now of opinion, however, and they have begun to act on that opinion, that with their present experience it will be advantageous to increase their supply of locomotive engines, and so provide for all needful repairs being effected with less of night work; and with that completeness which is impossible when engines are, of necessity, hurried out of the repairing shops, in order that the ordinary traffic of the line may not be stopped. Engineers and scientific men from different parts of the world are not unfrequent visiters at the Company's workshops, which are at all times accessible for the benefit of the public—whether for the purpose of scientific research, or of practical information.

The excavation of the new tunnel from Wavertree-lane to Lime-street is opened throughout its whole length, and will soon be ready for laying down the blocks and rails.

The Directors, in former reports, have alluded to the course which they had considered it expedient to adopt of substituting heavier and stronger rails in place of those which from time to time had been bent or broken, owing to the service to which they were subjected, from the speed and weight of the engines, being far more severe than was originally contemplated. From experience of the decided superiority of those parts of the way which have already been laid with the stronger rails, the Directors feel the propriety of proceeding to relay with heavier and stronger rails such portions of the line as have from time to time to be *taken up* for the purpose of substituting stone blocks for the original wooden sleepers; and they doubt not, in so doing, they shall obtain the concurrence of the proprietors.

By the foregoing statement of accounts it appears that there is a nett disposable profit for the half-year of.....	£40,346	6	7
Which added to the surplus from the last half-year	164	11	0
Amounts to.....	£40 510	17	7

Out of this sum the Directors recommend that a dividend be now made to the proprietors of *4l.* 10*s.* ℔ 100*l.* share, amounting to 35,859*l.* That 3,000*l.* be appropriated to the relaying of the way with stronger rails; and that the remaining sum of 1,651*l.* 17*s.* 7*d.* be carried as a general balance to the next half-year's account.

CHARLES LAWRENCE, *Chairman.*

NEW LIVERPOOL AND MANCHESTER RAILWAY.

In the interesting article on railroads (by Dr. Lardner) in the "Edinburgh Review" for October last, it is observed:—"The opposition of Lords Derby and Sefton to the (Liverpool and) Manchester Railway Bill, compelled the Company to deviate from the line of road which they first proposed, and which Mr. Stephenson, their engineer, pronounced to be the best. That line must have passed through a part of the property of these noblemen, whose opposition would at that time have defeated the bill. The Company were therefore compelled to select another line, which was not only much more expensive in the formation, but has been also much more expensive to work." After explaining how the height of the *summit level on this line*, and the *long rise towards it on each* side, has caused the expense of the locomotive power to be nearly quadrupled,* the Reviewer adds:—"But, if any thing be wanting to demonstrate the mischief of the proceeding out of which this has arisen, it is the fact detailed in the evidence of Mr. Moss, that a second line of railway has been contemplated, connecting Liverpool with Manchester; that *this second line is countenanced and encouraged by those very noblemen, Lords Derby and Sefton;* that it is to pass through their grounds, and, we presume, to take the very course which was originally contemplated by the present Rail-

* Yet in the face of this strong exception to the eligibility of the line of the Liverpool and Manchester Railway, did the veracious Mr. Cort impute to the Reviewer that he had pronounced it "the best railway in the world" (see our last No. p. 307)!

way Company, and from which they were driven by opposition."

It now appears that the plans and sections of the second line here alluded to have actually been lodged with the proper authorities, and that it is intended to apply for a bill to carry it into effect in the ensuing session of Parliament. At Liverpool and Manchester, this new line is known by the name of *the North Line*, from its taking a direction to the northward of the present railway. The Reviewer supposes that it is the very same line which Mr. Stephenson originally proposed, and Lords Derby and Sefton objected to; but either this is a mistake, or the view which Mr. Stephenson took of it was very erroneous. For it appears from a Report made by Mr. Vignoles, who was recently employed by the Directors of the present railway to survey this northern line, that it will not only cost a great deal more to execute, but that the levels and inclinations will be still more unfavourable. Mr. Locke, who assisted Mr. Stephenson in the execution of the present line, has also given in a Report to the same effect. The facts on which these two very competent authorities rest their condemnation of the newly proposed line, are these:

First—That the quantity of earth to be removed will be *at the least* nine millions of cubic yards—being *six* millions more than the amount of the cuttings and embankments of the present line.

Second—That the *shortest period* in which it could be removed would be *seven years*.

Third—That the cost of the earth-work alone will not be less than from 550,000*l*. to 600,000*l*.

Fourth—That, *compared with other lines* of railway, the quantity of earth-work, per mile, on the projected north line, is as follows:—160 per cent. more than on the London and Birmingham line; 180 per cent. more than on the Liverpool and Manchester line; 300 per cent more than on the Grand Junction line.

Fifth—That, notwithstanding the enormous extent and costliness of these operations, the levels and inclinations of the line would be worse than those of the Liverpool and Manchester way, even debiting this latter line with its tunnel and inclined planes; and particularly as regards the working of *the locomotive engines*, inasmuch as it appears that an engine, which, on the Liverpool and Manchester line, will draw 168 tons from Liverpool to Manchester (being assisted up the Whiston inclined plane, where an assistant engine is kept for the purpose), will be able, on the projected North Line, owing to the bad levels, to take only 108 tons!

Sixth—That the enormous sum above stated, of from 550,000*l*. to 600,000*l*., is for *earth-work alone*—the *preparation*, as it were, for the railway—and does not include the cost of the rails themselves, nor the purchase of land, the quantity of which will be proportioned to the depth of the cuttings; nor the building of bridges which will be extensive and costly in the same proportion, and the number of which is *nearly double* that on the Liverpool and Manchester line; nor the purchase of stations in Liverpool or Manchester, nor the erection of offices and warehouses; nor the cost of engines, coaches, and waggons, required for such a concern.

Should Lords Derby and Sefton persist, in the teeth of these startling facts, in giving their support to this opposition scheme (for though the line may not be exactly the same with that which they formerly opposed, it must, at all events, we believe, go through their estates, and is not likely to be carried against their consent); the next most consistent thing for them to do, would be to employ Mr. Cort as Managing Director—(who can doubt his responding to the call?). The lesson would then be as complete a one, in the way of edification, as could be desired. A second Liverpool and Manchester railway, promoted and patronised by the very noblemen who were the greatest opponents of the first; and managed by the same very discreet and respectable personage who has denounced not only the first Liverpool and Manchester, but all other railways whatsoever, as gross frauds on the public!!!

RECORDS OF GENERAL SCIENCE.*

The ranks of our scientific periodicals have been so wofully thinned during the last year or two, that the appearance of a new recruit is naturally hailed with a double welcome. But a few months back, no less than six publications devoted to the general purposes of science, were in existence, and apparently flourishing: but of all these, two only, the "Philosophical Magazine," and "Jame-

* By Robert D. Thomson, M. D., with the assistance of Thomas Thomson, M. D., F.R.S., &c., Regius Professor of Chemistry in the University of Glasgow. No. 1, January, 1826, 8vo. pp. 96. London: John Taylor.

linburgh Philosophical Journal,"
r in the land of the living. It is
iat from their ashes have sprung
rous, and, we fear, ephemeral
(so called) "scientific periodi-
all harping on the one string of
History, and all as light as gos-
-yet do they not by any means
pletely fill the ghastly void as
us think Dr. Thomson obnoxious
harge of presumption, for adding
to the meagre list of our properly
nated scientific magazines. On
trary, we wish every success to the
venturer.

number opens with a very elabo-
icle on calico-printing, from the
Dr. Thomson, of Glasgow, the
f the (defunct) Annals of Philo-
It is full of information, gathered
actical sources, and is illustrated
r a novel manner, not by engrav-
presenting the objects described,
the objects themselves. Small
f printed calico, of the kinds de-
in the letter-press, are neatly
in where they are alluded to,
g at once the results of the pro-
described, and forming one of
t of all possible commentaries on
t. This method answers admi-
the present instance, as it may
y others—but we are afraid the
y must still be stuck to when
engines or railways are the

the next article, a "Journey in
" by M. le Play, we extract a
relating to mining operations,
will serve to show that the Penin-
not likely to be so far behind-
in the "march of improvement"
enerally supposed, when its ener-
e allowed fair play:—it will also
that the rage for tearing riches
the bowels of the earth, *nolens*
is not by any means confined to
n country:—

e inhabitants of the mountainous
of Alpujarros, who had lived
he time of the departure of the
in a wretched and immoral state,
themselves from their lethargy, on the
ence of the destruction of the odious
ly (in 1820), and began to work their
nes. In the course of a few months
oor men were comparatively wealthy,
1826, no less than 3,500 miners were
ty in the Sierras of Gador and Lujar;
833, M. Play ascertained that 4,000
shafts had been opened in the Sierra of Gador alone. Before 1820, the royal works, which had the sole power of smelting ores, produced annually only 30 or 40,000 quintals of lead. In 1823, however, the product was increased to 500,000, and in 1827, to 800,000 quintals.

"This prodigious increase in industry created a great sensation in Spain; and all classes of society, directing their attention to the mines, conceived that they had only to turn up the soil, in order to acquire endless treasures.

"The government, at the same time, gave its countenance to the labours of the people, by forming two mining schools, the one at Madrid, the other at Almeyda, and by sending several young men to study the art of mining at Freiburg. M. Vallejo, who had been banished during the political disturbances, and had improved his time by studying at Paris, returned to his native country, and is at present engaged with a geological description of Spain. Erlorza, also, an artillery officer, having visited the iron-works of England, Belgium, Hartz, Piedmont, and France, has introduced the most approved smelting system of those countries into the neighbourhood of Marbella and Pedroso, in Andalusia. By his advice, the iron-works of Gallicia have been altered; and speedily his improvements will extend over Spain. During the short period described, the product of the mercurial mines of Almeyda increased; the ancient copper-mines of Rio Tinto, long neglected, were now worked with energy; the calamine mines of Alcaroz, in the eastern parts of La Mancha, are successfully explored at present; lead is raised in considerable quantities at Linares in Jaen, and at Falsete in Catalonia. In the neighbourhood of Oviedo rich mines of coal, which occur there, supply, although the communication is bad, the establishments of Andalusia. Coal-mines have also been opened by a company near the river Aviles; in another part of Spain, the small coal basin of Villa Mieva del Rio is worked with increasing activity, and supplies the steam-boats, which make the voyage from Seville to Cadiz in twelve hours."—p. 21.

Professor Thomson succeeds M. le Play with a paper relating to some very curious experiments on respiration; and this is followed by another on changes in the blood; and by "the History and Analysis of Vanadiate of Lead," by the editor. The rest of this division of the work is composed of translations from foreign periodicals, chiefly the "Annales de Chimie," and Poggendorff's "Annalen:"—the most important of these is a paper on the Magnetic Intensity of the Earth, by C. Hansteen, who, aided by

the researches undertaken by direction of various European governments (*our own not excepted*), has succeeded in throwing much light on this obscure and difficult subject. Some of his discoveries, however, it appears by a note, are as old as the commencement of the century, and due (*O! tempora!*) to an Englishman!

A review of Becquerel's "Traité de l'Electricité," and a variety of miscellaneous notices, wind up the number, which is a satisfactory one, upon the whole, although it requires no small share of the indulgence usually granted to a first beginning. The editor will do well, in future, to pay more attention to the mechanical part of his duties; the printing is full of faults and errors, especially in punctuation—sometimes to the essential injury of the sense. The translations also must be more carefully executed, and pains more uniformly taken to render foreign denominations of measurement into their English equivalents—a rather troublesome process, but one which *must* be gone through. It is a fortunate circumstance that a "Preface" will be seldom required, for that which ushers in the present number is wretchedly ill-written, and gives but a sorry foretaste of the intellectual banquet to come.

With due attention to these matters, we trust Dr. Thomson will succeed in establishing his work in the public favour. It certainly requires no little tact to cater for the very delicate appetite of the "reading public," as at present constituted, for a magazine of "general science." The reason, probably, why so many of the class went to the tomb of the Capulets within a short period, was that their contents were too heavy for the numerous troop of light readers, who now resort to more easily digested and prettily illustrated volumes for their supply of scientific information; and too diffusive for the tribe of soberer philosophers, the majority of whom content themselves with the Transactions of the one society, whose attentions are devoted to the one science they think worthy of cultivation. This seems plain from the number of these Transactions *having increased* as fast as that of the *"general"* periodicals fell off. Dr. *Thomson must steer a middle course between this* Scylla and Charybdis, and *meet the increased* difficulties of his task with increased activity and energy, if he would gain for his "Records" a permanent place in our periodical literature.

NOTES AND NOTICES.

London Fires in 1834.—Mr. Baddeley, whose annual reports, in this journal, on the fires of the metropolis, have thrown so much light on this interesting and important branch of its statistics, has sent us his report on those of the past year, but it extends to such a length, owing to the unusual number of *great* fires which have taken place during the period (that of the two houses of Parliament among the number), that we shall be obliged, in order to give it entire, to devote, next week, an extra Number to the purpose.

Mr. Gurney and Mr. Hancock.—We have received a letter from Mr. Hancock, which we very much regret did not reach us in time for insertion in our present number, along with the remainder of the evidence on Mr. Gurney's case. It is due to truth, however, to state, in the meanwhile, that it gives a positive contradiction, sustained by very satisfactory evidence, to most of that part of Mr. G.'s evidence which refers to Mr. Hancock.

We lament to have to announce the death, on the 1st inst., of Mr. Morris Salmon, for several years past the printer and publisher of this Journal. About five months back, one of his legs was broken in two places by a printing-press falling upon it, but he had nearly recovered from the accident, when the bone of the limb exfoliating produced an inflammation so severe, that in a few days it ended in mortification and death. He was in his 39th year. His skill, intelligence, and assiduity in business, liberal sentiments, cheerful, courteous, and obliging disposition, had gained him many friends, and will cause his early loss to be long and deeply deplored.

Mr. Sutton's suggestion shall be attended to.

We have received Mr Cort's rejoinder, but do not suppose that he will press for its publication, after seeing the Report from the Directors of the Liverpool and Manchester Railway, which we this day publish. If any thing can silence him, that will.

Ripsell Twirling will find all that we know, or, we believe, is publicly known, of Lord Dundonald's inventions, in our 583d, 584th, and 593d Nos.

Communications received from Mr. Marshall—Mr. Whitelaw—H. F., junior—Domesticus—Mr. Bowser—One desirous of seeing True Merit Triumphant—A. L.

☞ The Editor of the Mechanics' Magazine has made such arrangements as enable him to offer, on unusually advantageous terms, to undertake the solicitation of Patents for New Inventions, the drawing and revising of Specifications, and generally every other branch of Patent business. Drawings of Machines executed with accuracy and dispatch.

6, Peterborough-court, Jan. 3, 1835.

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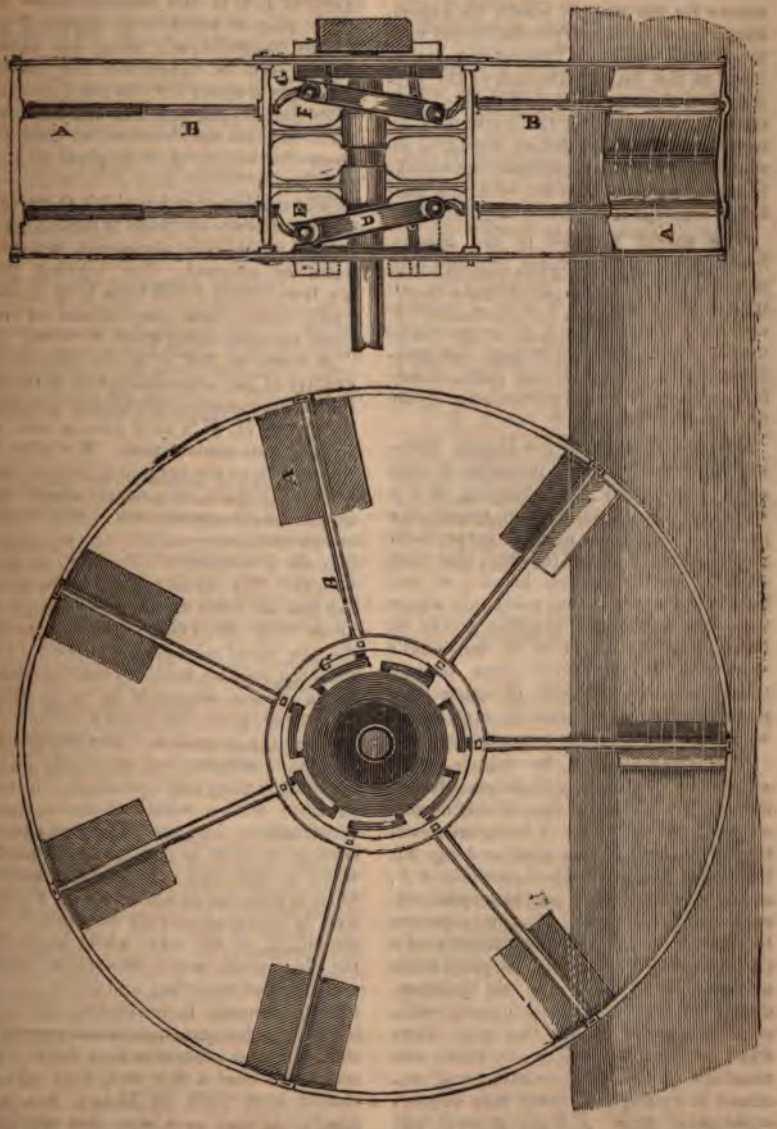
SYMINGTON'S PADDLE-WHEEL.



MESSRS. WILLIAM AND ANDREW SYMINGTON'S PADDLE-WHEEL.

We have so often had occasion to vindicate the claims of William Symington to the honour of being the father of steam-navigation—to speak with admiration of his mechanical genius, and with sorrow for the neglect which he experienced from his country—that it was with more than ordinary interest we recognised in the list of patentees of the present day, the names of two sons of that remarkable person, as the authors of an invention which has for its object, to remove one of the greatest drawbacks from the value of that art, of which their father was the ill-requited originator.

The patent granted to the Messrs. Symingtons is for a wheel, of a new construction, applicable generally to all motive purposes; but it is as a paddle-wheel for the propulsion of steam-vessels that it is most likely to engage the public attention, and that we shall, therefore, present it more particularly to the notice of our readers.

The specification of the Messrs. Symingtons describes their invention (nautically considered) as consisting of "a wheel for the propulsion of vessels, the paddles of which are made so to vary their positions as the wheel revolves, that they shall oppose the greatest breadth of surface to the water at that point only where they can exert the greatest power of leverage in the direction of the vessel's way, and at the same time occupy throughout less breadth of space than paddles of equal superficial area do in wheels of the common construction."

The arrangements by which these effects are produced, will be readily understood by an inspection of the figures on our front page; fig. 1 being an elevation of a wheel on this plan, and fig. 2 a transverse section. The paddles, A A, are in pairs, or, more properly speaking, each paddle consists of two separate leaves, attached to two separate shafts (B B), which shafts turn in pivot-holes at their extremities, and act independently of, yet in perfect unison with, each other. D D are two solid discs fixed immediately under the inner extremities of the paddle-shafts, and inclined at an angle of about nine degrees *to the main axis.* E E are grooves cut *in the peripheries* of these discs; and F F small guide rollers, which run in these grooves, and are attached, by the cranks G G, to the ends of the paddle-shafts. Before the wheel is set to work, the paddles are all turned endwise towards the water; but as it revolves, the small guide rollers, F F, cause, by their rotation in the grooves E E of the inclined discs D D, each pair of paddles to approach gradually towards each other, till, at their lowest point of depression, they meet at an angle of about forty-five degrees; and after that to open again in the same gradual way, till they resume, on emerging from the water, their original endlong position.

The combination by which these valuable results are obtained is certainly very ingenious—simple also—and, we think, perfectly original. The moving parts are few—much fewer than even in Morgan's wheel—and they admit of very great strength being given to them.

A wheel on this principle (though not exactly of the same description as the one represented in our engravings) was lately affixed to H. M.'s ship Alban, and two experiments made with it. We refer, for the results, to the subjoined Report from Mr. J. Dickson, engineer, whose long and intimate acquaintance with steam-vessel machinery entitles any opinion of his, on a matter of this sort, to great weight. We were present ouselves at the first of these trials; but though we agree with Mr. Dickson, that it proved the new wheel to be greatly superior to the common one, we must say that the manner of the trial seemed to us, by no means calculated to do full justice to the principle of the invention. The experiment was made with but one wheel only on the Messrs. Symingtons' principle, in conjunction with a wheel of the ordinary construction; and the effect was exactly similar to what is commonly witnessed when a spavined or broken-winded horse is coupled in harness with a roadster in unexceptionable condition. In proportion as the new wheel surpassed the old one in power, the latter necessarily served as a drag and strain on the former, causing it to revolve not only less rapidly, but less equably and smoothly, than it would otherwise have done. To make the trial a fair one, *both* wheels should have been on Messrs. Symingtons' principle; as it was, the principle had literally but half a trial.

Neither do we think the form of construction adopted in the trial wheel, by any means the best of the different forms pointed out in the specification of the inventors. Instead of having two discs and two sets of guide rollers—as in the wheel represented in our engravings—there was but one disc and one set of guide rollers (on the inner side of the wheel); that one set of rollers acting *directly* on the halves of the paddles next to them, and *indirectly* on the other halves, through the medium of cogged quadrants attached to the paddle-shafts, and working into each other—an arrangement not only mechanically injudicious, but calculated to give an appearance of complexity to the invention, which does not in reality belong to it.

MR. DICKSON'S REPORT.

Sir,—Agreeably to your desire, I send you the report of my observations on Messrs. Symington's paddle-wheel, during the two trials made on board his Majesty's steam-vessel Alban; the first on the 19th, and the second on the 28th November last.

FIRST TRIAL.

I paid a little attention to the steering of the vessel while the wind was on different quarters, from which I found that the propelling power of the new wheel was at least equal to the common wheel on the other side of the vessel (although the new wheel was about one-third less in width than the old), and the men at the helm acknowledged this to be the case.

As to clearing itself of what is commonly called the backwater, the new wheel certainly nearly accomplished that object. In the common wheel each paddle lifts a quantity of water to a certain height, and the falling of that water again from each paddle is what produces the great undulations astern so much complained of. This, as already stated, was nearly done away by the new wheel, and, I believe, seen by every person on board, by looking at the tracks of both wheels. From these advantages, and the very desirable one of the new paddles presenting only their edges to the air when out of water, I feel entitled to conclude that a vessel, furnished with two of these wheels well made and proportioned to the power of the engines, will go faster than the common ones, or, in other words, she will go the same speed with less power or fuel.

SECOND TRIAL.

During the second experiment the effect of *the old and of the new wheel* was well illustrated, as to working deep in the water when the ballast was shifted, so as to immerse the *old* wheel about 3 feet 6 inches in the water: the engines lost about one-third of their usual speed, and the new wheel retained nearly all its propelling power, for the vessel went double the rate at least through the water that it did with the old wheel in the same situation.

Considering that these trials were made on so large a scale as a vessel with engines of 100-horse power, I am quite satisfied that a vessel furnished with two of these new wheels would be able to face a rough sea, and maintain good steerage way a-head, when a vessel with common wheel, similarly situated, would be driven back, and perhaps lost with all on board.

On conversing on the subject with Admiral Sir Thomas Hardy while on board, I was glad to find that he agreed with me most decidedly as to the advantages to be derived from the new wheel, dwelling particularly on the little agitation it caused, and from the circumstance of its requiring a paddle-box full 2 feet 4 inches, or one-third less in width than that required for the old wheel.

With respect to durability, I have had about twenty years' experience in making paddle-wheels, and have no hesitation in saying, that the Messrs. Symingtons' paddle-wheel can be simplified and made to stand as much fatigue as the common wheel.

I am, Sir, your obedient servant,

J. DICKSON,
Engineer.

6, Charlotte-street, Blackfriars-road,
December 5, 1834.

SHIFTING PADDLE-WHEELS — MASHDOUD MOHANDEZ IN REPLY TO MR. CUNNINGHAM.

Sir,—Although I cannot boast of having "an English tongue," yet, I can say, that I know enough of the English language to form a sentence suitable to my case. About the beginning of 1831 I could not finish reading a number of the Mech. Mag. in less than two, and sometimes three, weeks, with the help of the dictionary. But the more we live, the more we learn; and I have not only learnt to read in the English, but have likewise learnt the difference between an Englishman and an Egyptian. They are different in ambition, different in pride, and in many other things which would require the "why" and "wherefore" to explain them, and perhaps I may not be allowed here to do. Many

times I have seen in the pages of the Mech. Mag., and in other books, men attacked for falsely showing the public, under different garment, the inventions of others as their own; and also the second inventor (unfortunately for himself) similarly attacked. Fraudulent men, however, are not satisfied with catching from books, &c., but many examples have been found of persons prying into other people's premises, and "taking in their eyes" the very thing which the owner of the establishment obtains his livelihood from. I do not wonder at the owners of important establishments for sticking on their doors the notice—"No admittance except on business." Here the fraudulent caused the innocent to be likewise suspected, and the friend a foe. It is, Mr. Editor, upon this ground, that when I compared Mr. Cunningham's invention with the one prior to it, and found them both one and the same principle, that I thought it was my duty (although a foreigner) to make known through the Mech. Mag. that the same wheel was in existence on paper. Mr. Cunningham may be a "second inventor," without his knowledge of the first. It seems that Mr. Kingston, the Government engineer, had not also heard, nor seen the original invention; but I hope that his certificate may induce the great folks of the sea to put it in practice.

My thanks are due to you, Mr. Editor, for your liberality.

MASHDOUD MOHANDEZ.

Norwich, Jan. 26, 1835.

THE LIVERPOOL AND MANCHESTER RAILWAY—MR. CORT AGAIN!

We mentioned last week that we had received a rejoinder from Mr. Cort, but that we did not suppose he would press for its publication after seeing the last half-yearly Report, which we then published of the Liverpool and Manchester Railway Directors. It will be seen, however, from the following note, that Mr. Cort has more "power of face" than we gave him credit for.

To the Editor of the Mechanics' Magazine.

Sir,—Observing that you have not inserted in *your present No. 600*, the Reply which I left at *your office to twenty different* charges made against myself and publication, for the exposure of Railway Impositions, on the strange supposition that I would not press for the insertion of such a letter after the wrong you have so extensively done me, merely because you have given *verbatim* in your pages, one of the authorities upon which the whole of my charges are founded against the Manchester and Liverpool Railway Corporation, I now again call upon you to do me that justice in your next Number. For instead of wishing that letter *suppressed* altogether, as you imagine, I am more desirous than ever that it should appear, especially in your scientific Journal, as I mean to give very extensive circulation to this very letter through other channels, that the whole community may, if possible, see the weakness of your "supplementary castigation."

I am, Sir, your obedient servant,

R. CORT.

2, New North-street, Red Lion-square,
February 6, 1835.

Here then—since Mr. Cort will have it so—follows the letter that is to prove to "the whole community" the weakness of our castigation, and the greatness of the wrong we "have so extensively done" him!

To the Editor of the Mechanics' Magazine.

"Truths would you teach to save a sinking land,
All fear, none aid you, and few understand."

Sir,—Although I fully expected from your well-known candour, that you would insert my reply to the attack made upon myself, in the character of a "*Railway Calumniator*," I did not expect to find your answer, running through no less than ten pages and a half, including my letter. For it convinces me that I have at last been able to arrest the attention of the public, when I find that the Editor, as you state, of "the most extensively circulated Scientific Journal," has thought me not unworthy of an answer—the weakness of which requires not many words to prove.

The first point on which we join issue is, whether the Directors of the Manchester and Liverpool Railway have or have not paid the dividends out of borrowed money?

In proof of my assertion, that such dividends had been paid out of borrowed money, I sent you two statements, made up from the reports, published by the Directors, from the commencement of the Railway, to the 30th June last, exhibiting the actual amount of money borrowed, not only with, but without dividends, and I now hand you the follow-

ing statement, bringing the account up to the 31st December last.

Expenditure.

Ways and works finished and unfinished	£1,156,563
Current outgoings	413,238
Dividends	286,555
Reserved fund for repairs	8,741
	£1,865,097

Receipts.

Capital subscribed	£796,875
Railway traffic	708,534
Balance	359,688
	£1,865,097

[The cash in hand to pay the last dividend 35,559*l.* was 23,790*l.*, *minus* about 12,000*l.* The money being invariably borrowed *after* the balance is struck; besides other liabilities exist not in the shape of *loans*.]

To destroy, if possible, the effect of the inference, which the statements I last forwarded lead to, you have taken an exception to their accuracy, and have asserted that the leading sum on the debit side, that is 1,156,563*l.* in the present statement, ought to appear on *both* sides of the *same* account.

Now, Mr. Editor, can you point out a single case where the same sum may be at one and the same time, in the shape both of expenditure and receipt? For until you can show such a case, it is evident that I have acted perfectly fair towards the Manchester and Liverpool Railway Company, in placing all the expenditure on one side, and all the receipts on the other.*

True it is, that a loan is in one sense of the word, money received; but it is only received to be returned hereafter†: while the capital subscribed is also money received, but *not* of necessity to be returned—a distinction so obvious and just, that when the Act was framed for this Railway, a specific clause was inserted, enacting that the interest on borrowed money should be paid before any dividends were declared.*

Had, indeed, the subscribers stipulated at the time that they became shareholders, that they were to be considered not as *bona fide* holders, but as lenders, then the capital and loans would be on the same footing; but such was not and never will be the case. For the subscribers calculated not on the return of the principal, but only on such increased interest for the money invested, as should repay them for risking the loss of it altogether; for the best of all possible reasons, as three-fourths of the whole capital is actually expended in labour or works of little or no value except for a railway†.

Still further (for as you profess to be influenced by no other motive than a love of truth, *you*, at least, will be open to conviction,) it is only necessary to state, that if 359,688*l.* being the amount of *borrowed* money, as far as the accounts reveal the fact, up to the end of last year, was required for new ways and works, had that money not been raised, either the works must have come to a *stand still*, or the shareholders must have made good the deficit; and, in the latter case, they would have been compelled to pay 69,043*l.* *more* than all the dividends received up to the 31st December, 1834.‡

Had, therefore, such been the result, what profits could they then have talked of, when they were actually *minus* 355,598*l.*? And how would the shares have kept their present premium; when, to meet such increased payments, the shareholders must either have sold out

* Nothing is more easy than to produce such a case as Mr. Cort requires; indeed, the difficulty would be to produce a case of the opposite description. For, how can money be possibly *expended* before it is *received?* And if as much is *expended* as is *received*, ought not the sum on both sides of the account to be the same? For an illustration of Mr. Cort's absurdity on this point, we refer to a sensible letter with which we have been favoured from a correspondent, inserted in another part of our present Number.

† So, then, Mr. Cort does admit at last, that the loans are to be considered as "money received." Having extorted this admission from him, we now ask *him to point where in the column of "receipts" he has given credit for the "money (so) received?"*

* Yes, "*interest*" on the borrowed money, but not the money borrowed itself. The Legislature had no doubts (whatever Mr. Cort may affect to have) about the money *lent* being as permanently invested as the money *subscribed*.

† As the shareholders can sell their shares in the market quite as readily as the bondholders can sell their bonds, the one class of capitalists are, in point of fact, just as much lenders as the other. Be this as it may, however, the capital of both has gone the same way—been wholly expended on the works (*no part of it whatever in paying interest or dividends*), and unless Mr. Cort can get over this fact, all his fancied distinctions must go for nothing.

‡ Although the "*new* ways and works" might have come to a stand still, the *railway* would not; and the point in dispute, be it remembered, regards the *railway* alone—the capital expended upon it, and the profits which it yields. And supposing the shareholders had themselves advanced the capital for these "*new* ways and works," they would have only stood in the shoes of the present bondholders, and received the interest that they now receive—THAT'S ALL.

at a discount, or been content to add to their risk nearly 50 per pent.*

† * * * *

The second and last point is, where I am accused of "falsification so deliberate and audacious" that you, Mr. Editor, "never, in all your experience, met with a similar instance;" because, after quoting the very words of Mr. Booth, as stated from his Report in the Edinburgh Review, I inferred that he had confessed the railway to be a *failure*.‡ For the whole sentence is as under:—

"It is further remarked, that in order to accomplish the transport of goods from the branches, and from intermediate places, engines are despatched several times a day from both ends of the line *to clear the road*, the object of this arrangement being rather to lay the foundation of a beneficial intercourse in future, than with a view to any immediate profit."

Now, if no "*immediate profit*" was contemplated by Mr. Booth, when this Report was made, in 1833, *after* the railway had carried more than half a million tons of payable weight, to such an extent must the undertaking be profitless, or in other words a *failure;* and one of the reasons assigned by Mr. Booth for that very failure, in this very document, is, that the differences between the estimated and actual results had added 33 per cent. to the original estimate of expense.

Nor is this the only fact; for Mr. Booth knows that the Directors originally estimated the whole traffic for conveyance by the railway to be, in 312 days, 1,279,200 tons, or in 3½ years, to June last, 4,477,200 tons, whereas the railway only carried 861,726 tons; thus proving that the railway had *failed* to carry 3,615,474 tons, as compared with the whole quantity originally estimated.

One of the items in the above estimate for 3½ years, is 546,000 tons of cattle; yet Mr. Booth confessed, in 1832, before a Committee of the House of Commons, the *failure* of all profit derived from such a source; for that, instead of carrying annually 156,000 tons of cattle, "*very few sheep had been carried:*" and beasts, we know, have only been conveyed experimentally, as the owners find that the four legs of nature are much less expensive than the four wheels of art.*

Here then, Mr. Editor, ends my present appeal to your candour and love of truth for an early insertion; and I could extend the letter to a considerable length, in reply to every specific allegation by yourself, but to which only one general answer is requisite, namely, that the question is not who I am, what I am, or why I have taken up the anti-railway cause, but whether my facts can be denied, or my inferences disproved. Still less can it affect the real merits of the case, whether Mr. Grahame has or has not gone over the same ground, and whether language has or has not been used, so as to form in your own phraseology a "*Billingsgate Olio.*"† I am, Sir, &c.

R. Cort.

2, New North-street, Red Lion-square,
February 9, 1835.

* No such results could or would have followed. The only difference would have been, that the same parties who had invested 796,875*l.* (or whatever the amount of the subscribed capital may be), in a way which produced them an annuity of 9 per cent., would have invested an additional 355,598*l.* (supposing that to be the amount of the loans), in a certain other way that brought them only the ordinary rate of interest—3 or 4 per cent.

† Mr. Cort here digresses a little, in order to bespatter the Stockton and Darlington Railway Company with a portion of his abuse; but until he establishes by his conduct, in regard to the Liverpool and Manchester Railway, his title to be regarded as a fair antagonist (which he has yet to do), we shall not allow him (as far as our pages are concerned) to enlarge his field of display. We make no doubt we could as easily vindicate the one concern as we have done the other; but is it not enough to have once shown that no regard is to be paid to any thing the accuser says?

‡ The "very words." !!! Surely a more impudent swaggerer than this never entered the field of argument. We charged him with a deliberate and audacious falsification, not "*because*" he had "quoted the *very words* of Mr. Booth;" but *because* he had ascribed to Mr. Booth words Mr. Booth never uttered, and had, by means of this false ascription, given a most false turn to those which he did actually use; and to show that we did him no injustice in so charging him, he gives the disputed passage at length, which proves all that we said of him on this head to be incontestably true!!! We have but to request our readers to contrast Mr. Cort's present edition of the passage with his former one, and then to decide for themselves between us.

* The three preceding paragraphs are all beside the question at issue, which is simply whether the Liverpool and Manchester Railway, *in its general results, and on the whole*, is a paying concern or not? The particular doubts here raised by Mr. Cort could all be laid with the greatest ease imaginable; but it is not at the instance of such a literary gladiator as Mr. Cort, they ought to be seriously considered.

† The "who I am," and "what I am," are questions of moment, and on this account—that the answers to them furnish the only satisfactory explanation that can be given of the circumstance (happily a rare one) of a man of cleverness lending himself to the propagation of calumnies so groundless, and interests so untenable, as those of which Mr. Cort is the chosen mouthpiece. He is, confessedly, the *paid instrument* of the canal proprietors and coach masters; and therefore it is that matters of fact are all to him, so far as this railway question is concerned, matters of no import whatever.

r, that Mr. Cort has been allowed to say all that he can for himself, we would hat it all amounts to? What single charge—out of "the twenty" against has he refuted? What "wrong" has he shown that we have done him? In- of replying to the "twenty charges" against him, he has replied to only two. se of them, and to these, in the most miserable manner imaginable. We ed him with slandering the Liverpool and Manchester Railway Company, in bing it, in his pamphlets and placards, as a losing concern, and the Directors as of public impostors; and we have proved—to the satisfaction we are sure of impartial person—that it was in truth a very gross slander. We adduced, as mong many proofs of the slander being a wilful and malicious one, that though ort was in the perfect knowledge of an official refutation of it having been hed by the Directors, he never made the slightest mention of that refutation—tted every where the charge against them—but suppressed the defence; *and to e makes no answer.* We hinted that he had made use of the respectable name r. James Walker, to give currency to his calumnies, without the authority of Walker; and to this also *he makes no answer.* We detected him in the very act ifying a most important document—the report of Mr. Booth—in order that it appear as if he had the sanction of the Company's own treasurer for his state-—exposed the cheat while it was yet fresh from his pen; and to this the only r he can make is a brazen-faced denial. Not one thing, in short, that we have his charge has he been able to meet satisfactorily, though the fullest oppor- has been given him to exculpate himself, if he possibly could. We must now ore have done with him. He has shown himself to be, as regards this railway r at least, a person so regardless of all the rules of fair controversy—caring not e outrages truth and decency, so that he can but blacken the parties he has ired—no, paid only—to slander and traduce, that it ought to be sufficient that known as such, to make any future notice of any thing proceeding from his n the subject of railways, wholly superfluous.—Ed. M. M.

THE RAILWAY DIVIDEND QUESTION.

—The fallacy of Mr. Cort's repre- ions respecting the Liverpool and hester Railway can scarcely be more manifest than they have ly been by your remarks; but you perhaps allow me to offer an addi- observation or two.

pting Mr. Cort's figures, it would r by the following statement that ailway Company have actually ex- d 107,690*l.* *more than they have ed:—*

RAILWAY, *Dr.*

ibscribed capital	£796,875
orrowed ditto	227,800
eceived for traffic	603,635
alance	107,690
	£1,735,700

RAILWAY, *Cr.*

xpended in works, buildings, &c.	£1,135,075
tto in current outlay	348,685
ividends and reserved fund	254,940
	£1,735,700

receipt must in this case precede equal, if not more than expendi- ture, it is presumed that the balance of 107,690*l.* to the credit of the railway represents the reserved fund which Mr. Cort very artfully mixes up with the dividends; and he obtains his balance of 335,190*l.* by adding that sum to the borrowed capital.

If the shareholders are to receive no dividend till they have paid back all the borrowed capital which has been sunk on the undertaking, I see no reason why any *dividend* should be paid them at all till they have also received back the whole of their subscribed capital and interest; but Mr. Cort does not give any reason why the railway shareholders should not have the same accommodation as shareholders in the canals or the coaches of his employers. It is well known that, with very few exceptions, and the exceptions are strong arguments in favour of railways, canals, with their warehouses and appurtenances, and coaches, with the horses, harness, &c., represent the capitals invested, and the dividends and profits are declared out of the excess by which the receipts exceed the current expenses,

and I believe in most cases without any portion of the excess being set apart as a reserved fund, confidence being placed in the proprietors for making provision for any unexpected contingency.

If I understand Mr. Cort's objections to railways right, they are, 1st, That they are visionary schemes, and will be injurious to the shareholders, because they will not benefit the public. 2d, That they will injure property vested in canals and coaches. 3d, That they cut up and disfigure the country.

The last objection is intended to catch the landed aristocracy; but there is an answer to it which they would not be well pleased to see impressed upon your pages, and the two former objections answer each other.

If railways do not afford the public greater accommodation than the present modes of conveyance, the public will not use them, and the capital vested in canals and coaches will not suffer.

If, on the other hand, the capitals vested in canals and coaches do suffer, it must be because the railways do answer, and then both the shareholders and the public will be benefitted, and Mr. Cort will hardly contend that the interest of the public is to be sacrificed to the canal and coach proprietors.

I am, dear Sir,
Yours truly,
A. L.

Manchester-buildings, Feb. 2, 1835.

WITTY'S PATENT MODE OF PROPELLING STEAM-CARRIAGES.

Sir, — The accompanying diagrams were made by me about three years ago, for the purpose of satisfying myself with respect to the principle of the mode of propelling steam-carriages, for which Mr. Richard Witty, engineer, of Hanley, Staffordshire, has obtained a patent. Should you think the subject-matter sufficiently interesting, I shall feel obliged by your giving them, along with the following demonstration, a place in your useful Magazine.

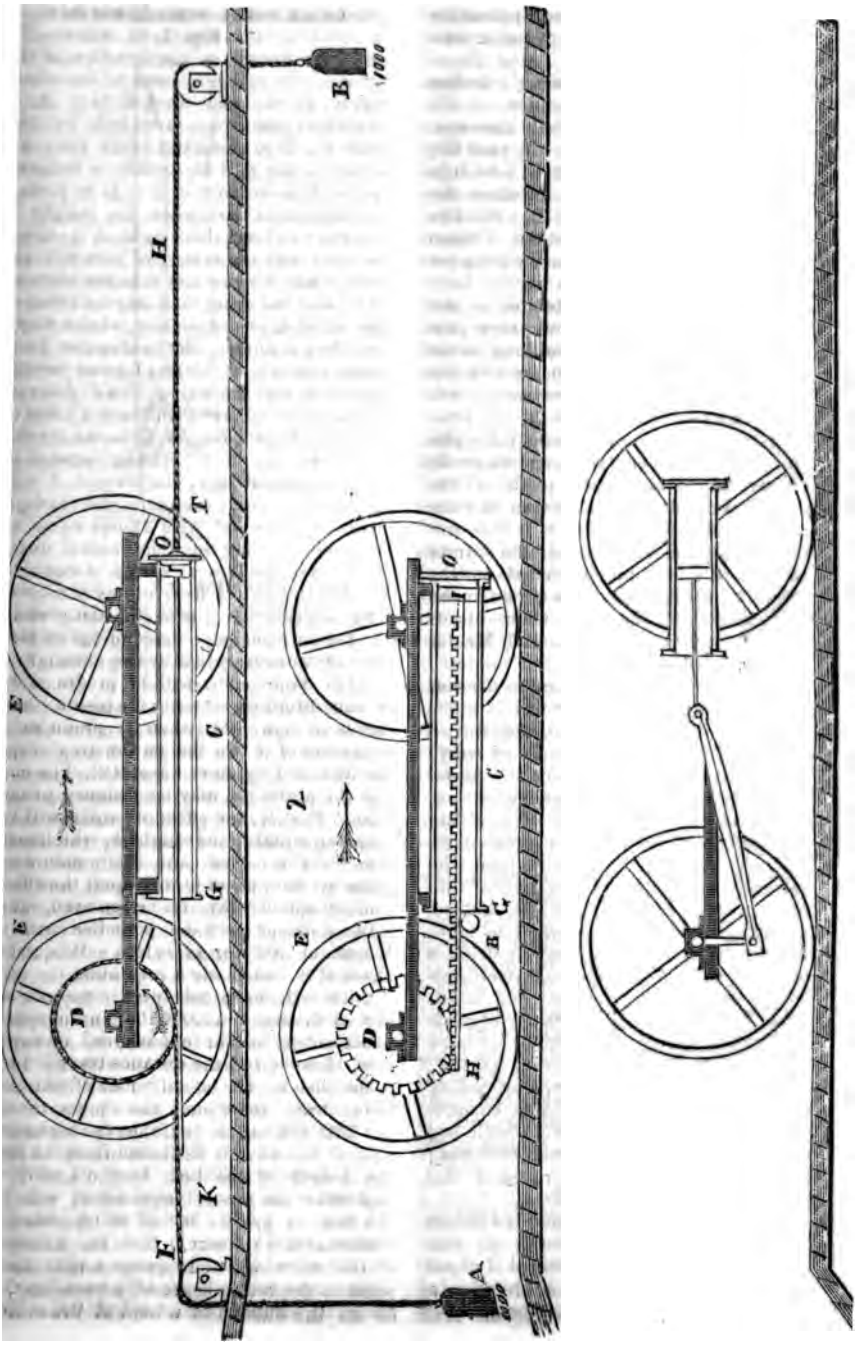
Yours, &c.
A Working Mechanic.

London, Dec. 15, 1834.

Demonstration.

E E represent the wheels of a carriage *5 feet* diameter; D a drum, 2 feet 6 inches diameter, firmly fixed on the axle of the wheel on which the cord F is wound in the direction of the arrow; C a cylinder, open to the atmosphere at the end marked G; A, a weight=1,000 lbs., attached to the cord F; B a weight=1,000 lbs., attached to the cord H, which is fastened to the cylinder cover at T. It is proved by experiment that when the weight B descends 15 feet, the weight A is raised 7½ feet; and the reason of this will appear, when we consider that the circumference of the drum D is only half that of the wheel E; consequently, as the wheel is 5 feet diameter, the carriage will advance upwards of 15 feet for one revolution of E, and the weight B will descend upwards of 15 feet; but only 7½ feet of the cord F uncoiling off D in one revolution, and the drum moving forward as fast as the carriage, the weight A will be raised 7½ feet; therefore, the carriage will be propelled with a force equal to 500 lbs., pulling in a horizontal direction. For the power exerted is equal to B descending 15 feet, minus A ascending 7½ feet=to 1,000 lbs. descending 7½ feet=to 500 lbs. descending 15 feet, the distance travelled by the carriage.

The same effect will be produced by steam admitted between the piston I and cylinder cover O, when it produces a pressure of 1,000 lbs. on the area of the piston and cylinder cover O. The end of the piston rod may be fastened to the cord F at K, the effect of which will be exactly equal to the weight A, which may then be removed, and the pressure on the cylinder cover O will equal the effect of B, which may also be removed, and the carriage will be propelled with a force of 500 lbs. as before. When the wheel E has made a revolution the carriage will have advanced upwards of 15 feet, and the 1,000 lbs. on the cylinder cover will have advanced upwards of 15 feet; but the distance travelled by the piston will be only half of [this, or 7½ feet, therefore, the pressure of 1,000 lbs. at K will have advanced 7½ feet, and this deducted from 15 feet the distance travelled, by the 1,000 lbs. pressure on the cylinder cover, will be equal to 1,000 lbs. effective pressure travelled 7½ feet=to 500 lbs. travelled 15 feet, which is the greatest effect that, can be produced, and is equal to the single stroke of the cylinder C. This


H
B
T
O
C
E
G
D
F
K
A
2
O
C
E
B
G
D
H

therefore, is the most perfect application of the power of steam to propel a carriage that can be made.

In fig. 2, D is a cog-wheel, 2 feet 6 inches diameter, firmly fixed on the axle of the wheel E, 5 feet diameter, the teeth of which work in the rack H; I the piston of the cylinder C, which is open at the end G, and into which the rack H is firmly fastened; B a friction roller for the rack to rest on. When steam is admitted between the cylinder cover O and piston I, of sufficient force to cause a pressure of 1,000 lbs. on the area of the piston and cylinder cover, the carriage will be propelled with the same force as in fig. 1, or 500 lbs. for the 1,000 lbs. on the cylinder cover, will have travelled 15 feet, while the pressure of 1,000 lbs., produced by the piston on the teeth of the cog wheel D, which recede from the teeth of the rack H with a velocity equal to half the velocity of the carriage, will have travelled 7½ feet; and this deducted from 15 feet, the distance travelled by the 1,000 lbs. on the end of the cylinder, the carriage will be propelled with a force equal to 1,000 lbs. travelled 7½ feet, or 500 lbs. travelled 15 feet.

In fig. 3, it is evident the same power will be exerted when the crank is at its maximum of effect; and therefore this method of propelling carriages by steam is the best yet discovered, for the power is exerted in a rectilineal direction, which is the best method of applying any power to produce the greatest effect. It will easily be seen by those who possess a knowledge of mechanics, that the powers of this carriage (or, indeed, any other with plain wheels) to move forward will be limited by the friction of the wheels, and that if a three-throw crank, with three single-stroked cylinders, be made use of, a nearly equable rectilinear motion will produce a more practical effect from the steam gained; and consequently its power in ascending inclined planes on railways is superior to all others now in use, those with cog wheels working in racks not excepted; even these would be improved if this principle were applied to them.

Mr. Witty, who has taken out a patent for propelling steam-carriages on this principle, has completed a model of about *1-horse power*, which he has frequently *exhibited to many* scientific persons.

QUICK CANAL PASSAGE-BOATS.

Fig. 1.

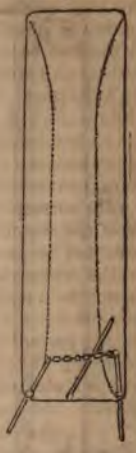


Fig. 2.

Sir,—Fig. 1 is a ground plan; and fig. 2 is an elevation, showing the stern, &c., of a twin quick passage-boat for canals. The boat described in No. 560 of your Magazine has the space in the centre so high, that the swell cannot rise to the top of it. In the plan here given, the wave is intended to rise to the covering of the centre space, and buoy up the boat. The advantage that I believe the plan now described has over the first plan is this; the boats will not require to be placed so far apart, and in consequence of this the twin-boat will take up less of the breadth of the canal. When one of the rudders is in action, the chain of the other one hangs loose.

I have shown before, that if the velocity of the wave raised by a canal quick passage-boat is not uniform, it, at any rate, does not increase in velocity in proportion as the speed of the boat is brought up; and I have also shown, that the boat can sail so fast, that the highest part of the wave is at about one-third of the length of the boat from its stern, and that the power required to draw the boat is greater before it (the boat) arrives at this velocity. Now the action of the wave will be pretty much the same in the centre space of a twin-boat, as on the outside of a boat of the ordi-

nary build, when the water is confined by the banks of a canal.

If one of the Paisley canal boats were taken to a narrower canal, it must be drawn quicker than its best speed on the Paisley Canal, to take advantage of the action of the wave at its stern. And if it were taken to a wider canal, it must go at a slower rate than its best speed on the Paisley Canal; or else the wave will fall *behind* the boat, and of course its force will be lost. One of your correspondents states, that "the rise of the water in the centre space of a twin-boat *is power lost;*" it may be so in the example that he has given, but it is not the case, I am almost certain, in every instance. I have written this, and the preceding paragraph, to give my ideas on the subject in another, and perhaps a clearer, light, than I have done before.

JAMES WHITELAW.

Glasgow, Jan. 1, 1835.

STEAM-CARRIAGES ON COMMON ROADS—THE CLAIMS OF MR. GURNEY AND MR. HANCOCK.

Sir,—In a supplementary number last week you published an abstract of the evidence given on behalf of Mr. Gurney's claim for compensation before a Committee of the House of Commons, in which evidence I am sorry to find there are many misstatements. I will, however, for the present trouble you with a correction of only one of them, which I hope you will do me the favour to insert as soon as possible, that it may thereby obtain the same extensive publicity.

"After he (Mr. Gurney) had proved the practicability of applying steam to locomotion on common roads, and had overcome some of the greatest practical difficulties, the subject was taken up by several other persons. Amongst the first was Mr. Hancock; he, however, did not turn his attention to it until he (Mr. Gurney) had driven him repeatedly round the Regent's-park, and the carriage had gone up Highgate-hill."

I am sorry to be under the necessity of giving this statement a positive contradiction. As far as regards me it is wholly untrue, with the exception that I did take a ride with Mr. Gurney (but I *believe only once*, and *not* repeatedly *as he states*), *and then for* a distance of not more than two miles, in going over which space the carriage stopped four or five times on a good level road, evidencing—not that "great practical difficulties had been overcome," but much imperfection; indeed I can confidently say, that I know of no practical difficulties that Mr. Gurney had *then* overcome.

I had began experiments upon a steam-engine of very novel construction *early in the year* 1825, peculiarly fitted, as I conceived, for the purposes of steam locomotion; and soon after I made a rough frame of a carriage, to which I applied two of these engines, making provision for the application of a kind of rotary propellers, which I also had made in readiness, in case I should find the friction of the wheels upon the road insufficient; and I have ample evidence that I gave a great deal of time and attention to this propelling apparatus. Now, does not this fact incontestably prove that the point in question (the necessity for propellers) had not then been ascertained, and that the doubt was common both to Mr. Gurney and myself? Besides, the rough frame of a carriage before mentioned was, *at the time I took this ride with Mr. Gurney,* nearly ready for trial, and about a fortnight afterwards was in actual operation. It was therefore impossible that the circumstance of this ride could have been the cause of turning my attention to the subject of steam locomotion. It would therefore have been more candid in Mr. Gurney either to have omitted all mention of a competitor, or to have been scrupulously correct in whatever he had to say of him.

Mr. Gurney deserves well of the public for the industry and talent he has displayed, and I cheerfully concede to him all the merit due to *his own peculiar arrangement* and application of steam power to locomotion. I never liked the general arrangement of his machinery, nor did I from the first either follow or copy him, nor have I since. We have indeed all along proceeded on plans as totally dissimilar as if we had been each at the opposite extremities of the globe. I leave him in full possession of every iota of his plans, both as to machinery and boiler; with this he should be content, and allow me the merit of whatever combination I may have originated in adapting a power the discovery of which

neither of us can claim, but which we have both in common exercised ourselves in adapting to this particular purpose. I am, for my part, quite content to wait till time shall have more decidedly put our respective carriages to the test of experience and hard work upon promiscuous roads; but in the mean time I must protest against any individual mixing up matters totally distinct, merely for the sake of erecting himself into a kind of "great first cause," that the *spring* and *source* of all these said matters may be ascribed *to him alone.*

I am, Sir, your obedient servant,

W. HANCOCK.

Stratford, Feb. 4, 1835.

THE BLEACHING MANIA.

(From Report in the *Colchester Gazette* of a Lecture delivered before the Chelmsford Mechanics' Institute, by John Murray, Esq. F.S.A., &c.)

Chlorine (from a Greek word signifying green) is the characteristic name given to a gas discovered by Scheele, in 1774, and called by him *dephlogisticated marine acid gas.* It was some time ago more generally known by the name of oxymuriatic acid gas, from a presumption (now considered to be erroneous) that it contained oxygen; and among manufacturers it goes by the name of the bleaching gas. The mode of obtaining it is very simple. We take black oxide of manganese and mix it with a small portion of muriatic acid, in a glass retort, and on the application of heat the chlorine is evolved. Either alone, or in combination with lime or magnesia, it may be, and is, employed for bleaching paper. I have no objection to its being used by the manufacturer in bleaching his linen and calico, but against the practice of bleaching paper I do protest. The consequences of thus using chlorine—which has the property of destroying ink and other colours—are, that many valuable epistles become illegible, and some have even dropped to pieces on the road. Some of our best modern books are already tottering on their shelves; and numerous deeds and valuable writings, requiring to be kept a great number of years, will, ere a very few, become useless. I have in my possession the remnant of a royal octavo volume, one of an edition of 30,000 copies, printed at the University press in 1818, and it is a singular fact, that there is not a perfect copy now existing. We find that when any thing of a delicate colour is wrapped up in white paper the colour is destroyed. A silk manufacturer once told me he could not preserve *his coloured silks;* he used the whitest and *cleanest paper* he could procure to wrap them in, but the colours invariably faded. I told him for the future to wrap them in common coloured, or brown, paper—he did so, and the silks retained their delicate hues. Paper stainers have lost hundreds of pounds in value, in consequence of the destruction of their goods by chlorine. This gas has also the property of dissolving gold. I knew a button merchant, who sent a quantity of gilt buttons to London for sale; being an expensive article, he took care to have them securely packed in white paper that they might be kept perfectly clean. The consequence was that the gilt corroded, and the buttons were returned unsaleable. Every thing now-a-days—such is the rage for bleaching—must be bleached. Our linen must be bleached, though by that means we render it yellow; our calico must be bleached; our ginger must be bleached, although at the expence of destroying the very principle which renders it valuable; and by-and-bye, I suppose, we shall be bleaching our daily bread. Let us, however, view the case as we ought. If we have an inferior article, paper for instance, the fault is ours, not the paper makers. We fix our prices, and if I am determined to have a quire of paper for 4*d.*, the manufacturer, knowing he cannot furnish it of sterling quality, is obliged to resort to the expedient of bleaching, for the purpose of giving a good exterior to a bad material. Perhaps the subject may be illustrated this way. Suppose I want a pound of confectionary, I walk into the confectioner's, and say, "if you let me have it for 4*d.*, I'll take it, and if not, why I can obtain it elsewhere," never, for a moment, recollecting that the very materials, or perhaps merely the sugar, costs double the sum. The consequence of this mode of proceeding is, that we have the privilege of swallowing with our confectionary a sufficient quantity of chalk. To such a pitch has the bleaching of paper been carried, that Government find themselves obliged to employ a person to watch the manufacture of the paper they require, for the purpose of securing it of a good quality. I know of two cases in which letters containing money have fallen to pieces by the road. One was directed to the post master of Sheffield, and it so happened that the check was found in the post bag—the person for whom the other letter was intended was not so fortunate. Every thing now is made into paper, and in consequence of its being bleached we do not so easily detect its inferiority. I have by me specimens of paper made not only from wool and leather, but from the bark of the willow, from hay and straw, potatoe peelings, wood shavings, saw dust, and, in short, any thing can be made into paper, such as it is.

" The ascending flames * * *
Spire with a bitter and severe delight."
Count Julian.

" Thanks!
Nor Hall, nor Abbey, gorged the glutton flame;
But scarce less piteous, a tremendous blaze
From domes, to Freedom and our country dear—
From walls wherein the British Senate sat—
Rose toward heaven majestic——and anon,
As with a magic haste, shore, bridge, and street,
Were thronged with living masses all a-glare;
And the red river, as on gala days,
Became a strand of life!" *Mirror.*

Dear Sir,—The commencement of another year affords me an opportunity of recording, in your pages, some particulars concerning the calamities of the past.

Although the aggregate number of fires for the year just ended does not greatly exceed that of 1833, the amount of property destroyed has been much greater, from the circumstance of many of the fires occurring in the largest class of buildings, such as extensive warehouses, or manufactories, and the like.

The fire-offices have had many heavy claims made upon their funds during the last twelve months, but I could sincerely wish that many more of the unfortunate sufferers by fire, had been able to call upon these valuable establishments to make good their respective losses. It is much to be regretted, that so many persons neglect to avail themselves of the highly important advantages afforded by fire-insurance; that the number of such persons is considerable, however, daily experience too clearly shows.

During the past year there have been, in London and the suburbs, six hundred and fifty-one alarms of fire as set forth in the following table:—

MONTHS.	Number of Fires.	Number of Fires attended by loss of Life.	Number of Lives lost.	Alarms arising from Fires in Chimneys*	False Alarms.
January	32	1	1	5	5
February	40	1	1	12	4
March	37	1	1	11	3
April	27	1	1	13	7
May	37	..	..	7	6
June	37	..	..	12	1
July	44	..	..	5	4
August	49	..	..	5	7
September	40	..	..	7	5
October	40	..	..	15	11
November	56	1	3	6	6
December	43	..	..	8	4
	482	5	7	106	63

Of the buildings in which the above fires took place there have been—

Consumed	28
Seriously damaged	116
Slightly damaged	338
	482
Chimneys on fire	106
False alarms	63
Making the total number of calls	651

By comparing the foregoing with last year's report of London fires (vol. xx. p. 274), it will be seen that the numbers of the *consumed*, and *seriously damaged*, are smaller

* *This does not include calls to chimneys* known at the time to be such, but only those that were *represented as bad fires, and* attended accordingly.

than in the year preceding, which is a striking proof of the success that has attended the exertions of the firemen.

Of the twenty-eight wholly consumed, it may be observed, that seven were very old buildings, chiefly built of wood, and otherwise offering great facility for the rapid spread of fire. Seven occurred in buildings filled with such highly inflammable materials, as to render it next to impossible to extinguish the fire, and left the firemen no chance of doing more than preserving the adjoining buildings. Six of the premises were so small as to be nearly destroyed before any alarm could be given at the engine stations. Four of the fires were so far distant as to be quite beyond the the reach of timely assistance from town. Four were consumed in consequence of want of water; and I know full well, that had a good supply of water always been at hand, several of the fires which swell the list of *serious* accidents, would have appeared in the next line as *slight* ones.

The following table exhibits the manner in which the fires have been distributed throughout the day and night.

	First Hour.	Second Hour.	Third Hour.	Fourth Hour.	Fifth Hour.	Sixth Hour.	Seventh Hour.	Eighth Hour.	Ninth Hour.	Tenth Hour.	Eleventh Hour.	Twelfth Hour.
A. M.....	29	19	23	14	9	11	8	8	13	8	18	19
P. M....	13	10	11	12	15	16	26	34	48	47	45	26

The daily distribution has been,—

Sunday.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
70	68	57	78	84	59	66

The following list shows the nature of the occupation of the different premises where the foregoing fires occurred :—

Apothecaries	2	Brought forward.....	88
Bakers	14	Firework-makers	2
Barge-builders	1	Farms	2
Basket-makers	1	Founders, brass and iron	2
Booksellers, binders, and stationers....	7	Gas-works	2
Brokers	3	Glass-blowers (illicit)	2
Cabinet-makers	1	Glass and emery paper-maker	1
Carpenters	19	Glue-boiler	1
Chandlers	2	Grocers	3
Chemists	4	Gunpowder-dealer	1
Church	1	Haberdashers, milliners, &c.	4
Chocolate-maker	1	Hat-makers	3
Cigar-maker	1	Hemp and flax-merchant	1
Coach-makers	4	Hotels	7
Coffee-roaster	1	India-rubber workers	2
Coffee-shops	6	Lamb-black makers	2
Confectioners	2	Linen-drapers and mercers	4
Corn mill	1	Lodging-houses	33
Corn-chandlers	2	Maltster	1
Colour-makers	2	Musical instrument-maker	1
Distillers	3	Oil and colourmen	2
Do. (illicit)	2	Oil and pickle-merchant	1
Dyers	2	Oil-refiner	1
Eating-houses	5	Paper-stainer	1
Feather-dresser	1	Pawnbroker	1
Carried forward.....	88	Carried forward.....	168

Brought forward	168
Perfume manufacturing	1
Pitch-maker	1
Printers	4
Prison	1
Private dwellings	183
Public buildings	3
Rag-merchant	1
Saw-mill	1
Ships	6
Ship-builders	3
Ship-breakers	1
Ship-chandlers	2
Silk-weavers	3
Shops (retail)	33
Stables	7
Steam-boat	1
Carried forward	419

Brought forward	419
Sugar-refiners	3
Tallow and wax-chandlers	2
Tinmen and braziers	6
Turpentine-maker	1
Tanner	1
Theatre	1
Unoccupied houses	7
Under repair	3
Upholsterer	1
Victuallers (licensed)	16
Vinegar-maker	1
Wadding-maker	1
Warehouses	12
Water-proof canvas-maker	1
Wine and spirit-merchants	4
Workhouses	3
Total	482

In the foregoing classification, care has been taken to distinguish between the fires that occurred in that portion of the building devoted to the purposes of trade or manufacture, and those that have originated in and damaged the dwelling apartments only; by placing the latter under the respective heads of private dwellings or lodging houses; so that a tolerably fair estimate may be formed from this list, of the relative liability of particular trades, &c., to accident from fire.

The following is an epitome of the causes which are supposed to have led to these fires; but this point it is often exceedingly difficult, and sometimes altogether impossible, clearly to determine.

There appear to have been caused by

Accidents of various kinds	40
Do. sundry, with candles	34
Do. from candles igniting bed or window curtains	112
Do. from gas	25
Do. from gunpowder	3
Do. from pitch and turpentine	9
Drunkenness	2
Flues and chimnies, defective, foul, or overheated	65
Fumigation, incautious	3
Furnaces, overheated, &c	11
Carried forward	304

Brought forward	304
Heating of hay	1
Do. lime	3
Do. tan	1
Loose shavings igniting	6
Manufactures, application of fire heat to processes of	15
Reading in bed	3
Stoves, defective setting, overheating, &c.	20
Tobacco, smoking of	6
Wilful	9
Unknown	114
Total	482

It is matter of observation, that particular classes of persons are liable to accidental fires from corresponding causes; thus, bakers are very frequently endangered from foul flues, or by the oven being overheated. Linendrapers and others are continually meeting with accidents from the articles of light fabric in their windows being ignited by the gas.

In private dwellings, candles are often incautiously placed so near as to come in contact with bed and window curtains; to which cause no fewer than one hundred and twelve fires were clearly attributable, during the last twelve months.

The defective construction, and imperfect cleansing, of flues and chimneys still proves a fruitful source of danger; during last year sixty-five accidents of this description would have been attended with serious consequences, but for the timely aid of the firemen. The number of chimneys on fire in the metropolis varies from one hundred to one hundred and fifty per month!

Wine-merchants and others run imminent risks from the common, but highly improper, *practice of entering vaults* and cellars with candles or other exposed light, *which dropped among the straw*, with which such places abound, causes immediate

inflammation. A lantern, or other *enclosed light*, should alone be suffered to enter any places where straw, shavings, or such like are scattered about

Wine and other cellars usually consist of brick arched vaults, having but one place of entrance, and therefore but imperfectly ventilated at any time; in the event of a fire taking place, the smoke which arises is of the most noisome description, and from this cause the firemen experience the utmost difficulty in getting at or extinguishing fires in such places. Some of the most troublesome fires have been of this description.

It is with much pain that I record the loss of seven lives by fire last year; it is some alleviation, however, to know that this is the smallest number reported for a great length of time. Three of the unfortunate individuals perished in the flames of their burning habitations, and one in endeavouring to escape therefrom. The remaining three lost their lives from their wearing apparel taking fire. Besides these, an elderly lady was burnt to death at Hammersmith on the 18th of November, but this fire not having been attended by the London firemen, it is not included in the foregoing report.

Several of last year's fires were of the most terrific description, and much larger than had before occurred, since the formation of the General Fire-engine Establishment by the United Insurance Companies. The first of these fires broke out in the evening of February the 7th, at Mr. Banks' sugar-refinery in Osborne-street, Whitechapel. The metropolis was at the time enveloped in a fog of the most dense description; when I reached the spot, a few minutes after eight o'clock, the lofty building was one mass of brilliant flame. The several engines were brought up with great promptitude, and most skilfully directed. Although the square pile of building, in which the fire originated, had got so thoroughly inflamed as to be consumed, some other buildings in immediate connexion with it, containing a steam-engine and other valuable property were saved; the fire being stopped in the passages of communication, in the most masterly manner. While the fire was at its highest, a policeman arrived with intelligence of another bad fire at Poplar; two engines were immediately spared, and galloped off to afford the required assistance.

Another alarming fire broke out at two o'clock in the morning of June 16, at Mr. Price's, in Bishopsgate-street, and consumed that and adjoining houses; the buildings were all very old and full of dry wood-work, and so intimately connected, that it was for some time impossible to stop the progress of the flames; ultimately, however, the perseverance and intrepidity of the firemen were successful, the fire being fairly beaten in the houses on either side to which it had extended. On the 11th of September, another sugar-refiner's was destroyed by fire, viz., that belonging to Messrs. Watson and Co., in Pump-court, Ratcliff-cross. When the fire was first discovered, it had got so great a head as to render it impossible to save the premises; by great exertions, however, the fire was prevented from extending beyond the building in which it originated. On Thursday, October the 9th, at noon, a fire occurred at Messrs. Powell and Co.'s oil and pickle warehouse, in Laurence Pountney-lane, from a candle dropped in the cellar; the engines were quickly on the spot, and soon in full work, but for reasons already adverted to, the fire could not be got at; the smoke, which was of the most intolerable description, issued in great abundance, and for a time kept the firemen at bay: after some time an entrance was partially effected, and the water was thrown more advantageously. For five hours and a half all the engines in attendance (about ten) worked into the building incessantly. The cellar was partly filled, and every floor covered, with water, to the depth of several inches, notwithstanding which, at about half-past five o'clock in the evening, the flames suddenly burst up through the whole building, with a vehemence that surprised all who saw it; the firemen were for a moment astounded, but they soon rallied, and poured in their streams from various well chosen positions, with such good effect that the triumph of the flames was short.

All other fires sink into total insignificance, however, compared with the calamitous *conflagration* which destroyed both houses of Parliament. This fire of fires, broke *out at twenty* minutes before seven o'clock on Thursday evening, the 16th of Oct., *when an immense* body of flame suddenly burst forth from the lower end of the *House of Lords.*

I was called to the scene of action about seven o'clock, from observing a deep crimson hue in the sky, which pretty well indicated both the situation and magnitude of the conflagration, although there was a strong twilight at the time, and the moon was shining with great brilliancy. On arriving in Old Palace-yard, about half-past seven, I found the House of Lords, and suite of rooms facing the Yard, enveloped in one vivid mass of flame; the House of Commons soon after ignited; and the fire, fanned by a strong south-west wind, gradually extended to the Commons' committee-room and waiting-room, &c.

Several engines had arrived, and were stationed by their foremen in Old Palace-yard, as was supposed, under the idea "that they could never be wrong when they laid their engines abroadside the burning buildings." The water, though at first rather scant, was afterwards tolerably plentiful; the engines were well manned, and worked with great spirit, but their powers were for some time sadly misapplied.

Several of the firemen mounted the portico in front of the building, pouring their jets of water upon parts that were in a state of most intense combustion, while it was evident enough to all but themselves, that they were exposing themselves to great danger without a possibility of being useful.

Several engines belonging to the London Fire Establishment were in full work by half-past seven, when that from Watling-street station arrived, with Mr. Braidwood, the superintendent, who immediately commenced a survey of the fire, for the purpose of placing the men and engines under his command in the most advantageous positions. Mr. Braidwood was not long in forming his "line of battle," and all the force of the combined Establishment present, became actively engaged with their elemental foe.

Soon after eight o'clock, the flames were advancing towards the square turret at the corner of St. Margaret-street, at the uppermost window of which several persons appeared, and in the most earnest manner implored assistance; two or three ladders were at hand, but they all proved too short to reach the window; a call was immediately raised for the brigade ladders, and it was most promptly answered. Several lengths of scaling ladders were instantly brought to the spot, and the two first ladders were scarcely put together when Mr. Braidwood came up. Length after length was added, until six had formed a ladder of the requisite height. The joining and raising of six ladders is a work of some minutes; while it was steadily proceeding, the most intense anxiety was depicted on the countenances of all the spectators, and when at length the ladder reached the window where the unfortunate persons were collected, a simultaneous shout of applause burst from the assembled throng. The persons thus rescued proved to be Lord F. Fitzclarence and some soldiers; his lordship was the last to descend.

The promptitude with which the ladders were brought up, and the steady masterly style in which they were elevated, reflect much credit on Messrs. Adams, Carter, Elderton, Moore, and George and Henry Rose, who, under the direction and with the assistance of Mr. Braidwood, effected this movement. These ladders were very extensively employed at this fire; their construction has been fully described at page 184 of your 22d vol.

Long before eight o'clock great apprehensions were felt for the safety of Westminster-hall, and it at length became evident that the fire had extended so much in that direction as to place it in the utmost jeopardy.

To effect the preservation of this venerable building appeared to be a strong and universal feeling, and the most extraordinary efforts were made on its behalf. Mr. George Colf (late foreman of the Alliance) of the Farringdon-street station, ran his engine into the body of the Hall, and was quickly followed by Mr. E. Bourne, of the Waterloo-road station; two other engines, placed in New Palace-yard, supplied the former with water.

The firemen ascended by means of a ladder to a lead flat outside the great window of the Hall, and kept up a continued deluge upon the flames that confronted them.

Several noblemen present being extremely urgent for the preservation of the finely-carved *King's Arms, it was lowered* from its place, and lodged in safety, by W. Free and T. Colcomb.

Perhaps the fire experienced the most determined resistance and most decisive check at this point. The public press, speaking of the conduct of the firemen, observed, " their exertions were all that could be expected from zeal and manliness."

" Distinctlier there
We saw and heard with what hydraulic skill
The dreadless fireman combated the flame,
Unheedful he of peril. There we saw
The fragile rafters blazing at his feet;
And the hot lead on his broad helmet fall
Like rain-drops dripping."

A distinguished gentleman, who was present for a length of time, writes as follows: —" I gave all my attention to the Hall, and it is due from me, who was almost constantly present on the lead flat outside of the great southern window of the Hall, from a little after seven o'clock until half-past ten, to state, that the preservation of this, our country's pride, is solely attributable to the unrelaxing and brave exertions of two men of the names of FREE and SOLOMONS, belonging to the London Fire Establishment, whose engine was stationed in the body of the Hall; and to two other men, of the names of WEST and WILLIAMS, belonging to the County Fire-office, whose engine was stationed in Palace-yard, and made to play on the spot I have mentioned, by means of the hose being conveyed to the Hall through the narrow passage that leads into the Yard under the south-western corner of the Hall." Wm. Free* had his helmet burnt upon his head, and his coat covered with melted lead; his hands were also much burnt, but he most heroically kept his post, although at the time much indisposed from a violent cold, caught at Messrs. Powell's fire, in Laurence Pountney-lane, on the preceding Thursday; he ultimately suffered a severe illness in consequence of his exertions, from which he is only just recovered. Josh. Solomon, his comrade, received a severe blow on the head from some falling timber, and was carried to the hospital much injured. Another intrepid fireman belonging to the establishment, John Hambleton, is still confined to the hospital, where he has been suffering with exemplary patience and fortitude the consequences of a double compound fracture of his leg, and the preservation of his life reflects the highest credit on his medical attendants. His brother, Edward Hambleton, was with him at the time of the accident, and had a most miraculous escape.

I most sincerely hope that the extraordinary exertions of these individuals will not be suffered to go wholly unrewarded; a promise of future recompense was made at the time, by the gentleman whose words I have quoted, and I hope the circumstance will not entirely escape his memory.

While some portion of the men belonging to the Fire Establishment were thus occupied in effecting the preservation of the Hall, a great number were engaged with equal zeal at various other points. The courts of law, which were for some time in imminent danger, were wholly preserved. The fire attained a considerable head in the Speaker's house, and nearly half of it was destroyed; but the firemen were eventually victorious. At a very early period of the evening, three engines were placed at the corner of Abingdon-street, for the purpose of saving, if possible, the library and committee-rooms of the Lords, and the Parliament offices adjoining; this was a work of much difficulty, but it was happily accomplished.

Not to occupy more of your valuable space by entering into further detail, I may briefly state, that the conduct of the firemen belonging to the united offices was such as to merit the highest praise: the Establishment mustered twelve engines (exclusive of the floating engine) and sixty-four men. There were also present about eighteen parochial, fire-office, and other engines, acting independently of each other, under their respective foremen, whose mismanagement created considerable confusion.

This circumstance gave rise to a very general feeling among those assembled, and one that was somewhat strongly expressed by the public prints,—that " for the first two hours of the fire, although there were engines enough, and the men were actuated by a zeal and hardihood which cannot be too much commended, yet there

* Who formerly belonged to the London Assurance Corporation.

was scarcely such a thing as systematized command or intelligent direction amongst them." "In fact, while the individual exertions of the firemen were most admirable, their general management was execrably bad; subjected as it was on so important an occasion to full exposure, it would have been most ludicrous, but that it seemed fraught with disastrous consequences."

It was unfortunate, but wholly unavoidable, that at the fire in question, the evils of the old independent mode of proceeding were most strikingly evident, while the great and important advantages of the co-operative system were not so apparent. This arose from the circumstance of the men belonging to the United Establishment combating the flames at close quarters, and therefore at points not visible to the bulk of the spectators. All those persons, however, who, like myself, had an opportunity of observing the exertions made simultaneously at various points, will bear ample testimony to the judicious and zealous exertions of the firemen, and the skill by which they were directed.

There were many circumstances that combined to render the suppression of this fire exceedingly difficult; and it is quite certain, that but for the extraordinary efforts of Mr. Braidwood and the men under his command, the fire would have extended much farther; in fact, it is difficult to say where it would have ended.

It is but justice to state, that several of the engines engaged gave great assistance to the combined force. The Norwich Union Society's engine, and one of Bramah's construction, brought by the Royal Horse Guards Blue, were admirably worked and skilfully directed.

The London Fire-Establishment continues steadily to improve, and its advantages begin to be better understood, and more fully appreciated, by the public at large. The men have on every occasion shown the greatest alacrity and zeal, and have conducted themselves in a most praiseworthy manner. The skilful management of Mr. Braidwood has given such effect to the force under his command, as to render far more efficient protection to lives and property than could possibly be accomplished by the more numerous independent bodies on whom this duty formerly devolved.

But it is matter of extreme regret, and reflects no small disgrace on those concerned, that this protection should be permitted to depend entirely on the spirit and enterprise of a few trading companies! Such, however, is the fact.

The *sappeur pompiers* of Paris, and the continental fire-associations, have long been celebrated for the success of their systematic exertions; in Edinburgh, in Manchester, and other provincial towns, the inhabitants are under the protection of a well-organised and efficient fire-police; but in this—the first metropolis in the world—we are altogether destitute of such a provision. It is to be hoped that the Legislature will shortly correct this crying evil, and by attaching the parochial engines (at present worse than useless) to the police force, under one superintendent, render them an efficient body of men, capable of affording most prompt and effectual assistance under every emergency.

How these things are managed by some of our trans-atlantic brethren, may be seen by the following extract from the American Railroad Journal for May 10, 1834:—

"*Splendid Fire-engine.*—We do not believe there is in the world a more magnificent thing of this sort, than the new engine belonging to the *Columbian Company*, and which that spirited association have been exhibiting to their fellow-citizens, at the engine-house in the rear of St. Paul's Church. The frame of this elegant machine is of a very superior construction, and the ornamental appointments are of the costliest and most tasteful description. The carving is done in mahogany; but so beautiful is the gilding and bronzing that it would be taken for solid metal. The plating is superb. The painting is excellent, as well in design as in execution. The motto of the Company—'*Actuated by benevolence, impelled by emulation*'—is not only beautifully engraved, but is much truer to the intent, and nearer to the actual character of our gallant fire-companies, than most mottoes are. The back scene, representing the parting of Otwa and Azula from the course of Talhoosin, is uncommonly fine. In short, the whole work reflects the highest credit, as well to the *various artists who have been* employed in its construction and decoration, as to the *deserving company of young* men to whom it belongs.

"The whole existence of such a body as our firemen—volunteers as they are altogether, in arduous, fatiguing, and often perilous duties—seems to us in a high degree characteristic and peculiar. In London the firemen receive regular pay, and are a body apart. In Paris they are a military corps, *sappeurs et pompiers*. In our American cities they are young men of all pursuits, who spend time, labour, and money—much money sometimes, as the decorations of the engine above described will prove—for the general good, without any compensation to be named; for the exemption from jury duty, and a portion of taxes, is nothing in comparison with the sacrifices. Yet there is among these volunteers much skill, and probably more emulation, than in the paid servants or soldiers of other countries."

The motto of the London Fire-Establishment being UTILITY alone, ornament of all kinds has been avoided as superfluous; but formerly the insurance companies' engines were very handsomely adorned. About three months since Mr. Lott, of Long-acre, constructed a fire-engine for the West of England Fire-office at Exeter, which was the most elegant thing of the kind I ever saw, and for workmanship and decoration may very well be put in comparison with the American engine described above.

There can be no doubt that the volunteer principle, as applied to firemen, answers extremely well on the Continent and in the United States; it might also be successfully adopted in most small towns in England and elsewhere, especially as incendiary fires are now so prevalent. For large towns, however, and for this metropolis in particular, it is wholly inapplicable, as in such places the expense becomes too great, the services much too arduous, and too frequently required, to be sustained by voluntary exertions. At the same time it should be observed, that although our fire-establishment is composed of paid servants, yet these are supported by the *voluntary contributions* of the several insurance companies, who are not in any way *compelled* to maintain such an efficient and expensive establishment, but do so of their own free-will; but for the protection thus afforded, London would surpass all other cities in the extent—as it does in the number—of its destructive conflagrations.

I remain, Sir, very respectfully yours,

WILLIAM BADDELEY.

10, Wilderness-row, Goswell-street, Jan. 31, 1835.

ON BIRCH'S AXLES—WITH A POSTSCRIPT ON CHIMNEYS.

Sir,—"Birch Rod" seems at any rate to be a tooth-and-nail advocate of the cause of Birch's axles, but I cannot in his last communication find any thing to convince me that my first opinion was wrong—yet this, perhaps, may arise, as he remarks, "from my not being open to conviction," though with only "inconsistent reasoning" to back me. Perhaps he may be right; we are few of us impartial judges in our own cause; and I bethink me that you yourself once averred in the review of the "Producing Man's Companion," that you did not consider me a good reasoner. Let those who are interested in the result decide.

As I begin to suspect that we may argue "till the crack o' doom" without coming to a conclusion, I shall not take up much of your space with recapitulation.

When I asked who the mechanics were *to whom* "Birch Rod" referred in proof of the soundness of his positions, my only possible motive must have been because they were *quoted*, and I wished to know what was the authority—who vouched for the voucher. "Birch Rod" might as well have alleged that Smith or Jones considered "double nuts superfluous," as that "mechanics" did so.

"The merit of the improvement is claimed for the cylindrical barrels alone." Be it so—I have again and again granted the advantage of the barrels, as giving a double chance against the wheel sticking fast, against which, however, there is the objection of extra size and weight.

"Who is Junius, that his solitary opinion should outweigh the opinions of a whole society?"

Answer.—A voice, and nothing more. My voice is tranferred to types and speak in these pages. I gave an opinion on an axle, but I did not in any way vouch the correctness of that opinion. Had

nion been quoted by another per-
a proof of the excellence of any
ical subject, then it would have
fair question to ask "who is
"—How know we that his judg-
worth any thing? If sound
of Junius on mechanical subjects
e adduced in answer, then the
of Junius might fairly stand for
h, though he might belong to no
" whatever. "Birch Rod" seems
ler that I have no claim to me-
skill, beyond "using mechanical
instruments"— that I do not
n *practical* details." He is in
What I write is founded entirely
tical knowledge. Mechanical
frowned upon my birth, and all
hanical theories I possess have
ilt up in my own brain, nurtured
xperience gained out of my har-
ands. I do not ask him to be-
, for I can bring no vouchers—
" societies," but there are few
s on which—few tools with which
e not essayed my right hand's
, with more or less success; and
ntages I have reaped from thus
instead of dividing labour, has
l me to reflect on the mischievous
retardation which has been
by apprentice laws and the mis-
olicy of the Trades' Unions, who
the Chinese system of making a
ort of machine horse. This sys-
carried on, would reduce the
ce of English mechanics to a
n resembling that of the East
astes.

s not necessary that the arm of
axle should be of the same size
rm of any other axle, because
els act as a stay to it, and give
nearly as much strength as if
le were solid."

t not reasonable to think that an
is liable to break when a trans-
ision is made in it? because the
rm is then reduced to the strength
rm of the diameter, that the
arm is at the incision."

reader, is not this either a sam-
asuistry or a sample of contra-

If the barrel surrounds one
e box surrounds the other, as
s to compensate for the reduc-
ake it as a contradiction. The
arm with the barrel is not liable
-the reduced arm with the box
is liable to break. Yet this writer talks of my "not being open to conviction."

I wish Mr. Birch joy of the new advantage his friend has discovered, in economising old axles by means of the cylindrical barrels, to suit those who (*qy.* wisely) wish to retain the old conical form of the arm.

I remain, Sir,
Yours very truly,
JUNIUS REDIVIVUS.

January 31, 1835.

P.S.—In the *Morning Chronicle* I saw a statement, that all persons constructing or altering a chimney, so that it cannot be swept with a machine, are liable to 100*l.* penalty. This clause would have been sufficient to extinguish the misery of climbing boys by the agency of informers, but our sapient legislators, with their accustomed regard to lawyers' interests, have virtually defeated the object by letting in a flood of litigation. Who's to define the kind of chimney which can or cannot be swept by a machine? A judge and twelve jurymen and four barristers, and a host of witnesses, false-swearers and all. One of your correspondents in a late number comments on my proposition for square cast-iron flues to be built into the walls, and says cylindrical ones would sweep more easily. Undoubtedly so, but would they *build in* so easily. We can make a square brush, but the law interferes with us if we make bricks out of the common form.

I shall be glad to see R.'s series of papers on the right definition of wealth, and will then reply to them. We had formerly an unfinished controversy. He must take as my best reply to it the postscript to the letter on the physical or moral commencement of national education.

THE CASE OF A POOR INVENTOR.

Sir,—In some of the back numbers of the Mech. Mag., I read some very just observations on the impolicy of the patent laws, in which observations you clearly showed the injury that is often done to the *poor* man, who, though ingenious and industrious, is totally shut out from all the benefits he ought to receive for any good and useful invention of which he may be the author, in consequence of his poverty preventing him from defray-

ing the heavy expenses of a patent. Under existing circumstances he has but one course to take, and that is to offer his inventions to some one possessed of more of this world's goods than himself. This, sir, is exactly my case; I have *invented* and *tested* by experiments an apparatus of the greatest public utility, by the sale of which a *clear weekly profit* might be realized of 140*l.*, by the employment of 80*l.* or 90*l.*, at the most, to begin with; but having no pecuniary means of my own, I must wait until I meet with a gentleman who may be willing to join me, and to whom, as a matter of course, I must surrender one-half of all profits, for the use of the small capital he will be required to advance for the patents, and to set the business agoing. In a few weeks he would have all his advanced money returned, and have a half-share of all profits for fourteen years to come. This, sir, would be making money in a pretty quick way, I guess (as brother Jonathan would say); but I must submit to it, as I do not suppose the patent laws will ever be altered during the very short time I shall have to remain in this life, being already far advanced in years.

I remain, Sir,
Your obliged servant,
J. Marsh.

26, Union-street East,
Bishopsgate-street.

THE UNDULATING RAILWAY SYSTEM.

Sir,—I heartily sympathize with Mr. Badnall on his disappointments, mentioned at p. 253, vol. xxii., for an unfit or lazy engine, however powerful, would entirely obscure the brilliancy of his experiments.

My reason for troubling you with this is to say, that I think he has not, in his letter, made the best of his case; he has not advocated his own cause well; he has not dwelt sufficiently on that (in my opinion) very essential point, viz. that the engine should *always* be exerting its power on the load, at whatever velocity it may travel: when the engine works, and does not drag or drive the load, but rather *vice versa*, the principle is lost. This dilemma was one of the failing "circumstances" alluded to by me in my first *letter on this subject*, vol. xix. p. 198. I *foresaw cases* would occur, where the *engine could not* go fast enough for the increased velocity, and then the principle and advantages of the undulating invention would be destroyed.

In further familiar explanation of this principle, let me observe, that every one knows no artificial power is required for the descent; gravity will effect that, and great part of the ascent also; then if the power of the engine all this while be exerted, in accelerating the motion, such acceleration must become a storehouse of the whole power of the engine during the descent, and part of the ascent (friction excepted), 'bottling up the go,' as the vulgar have it; but if any thing obstruct this acceleration, the storehouse is robbed of so much, the "supplies are stopped," and, perhaps, at their most productive period.

If any thing defeat Mr. Badnall's plans, it will probably be the dangerous velocity necessary for the *full development* of undulating power; but I think the triumph of his principle is complete—his science is secure—he has turned a mighty and cheap power into a new channel; it rests with himself or others to find a safe and effective medium for its operation.

Fairman's "engine, of 50-horse power, of strong and permanent workmanship, which, both engine and boiler, will not weigh more than three tons," p. 260, vol. xxii. (if it have not too much moonshine about it), will be just the thing I have been looking out for, for my steam-carriage, which is standing still for want of an engine of one-fifth of that power, at that weight.

Your obedient servant,
Saxula.

Jan. 20, 1835.

GUN WITH A REVOLVING BREECH—SIMPLE MODE OF INCREASING THE TRACTIVE POWER ON ROADS—RELIEF-WHEEL FOR COMMON ROAD STEAM-CARRIAGES.

Sir,—The following matters are submitted for insertion in your truly valuable publication, should you deem them deserving a place in it.

I am, Sir,
Your obedient servant,
Robert Carey,
Rector of Donoughmore.

1.—The first invention to which I would call your attention, is a gun with

a revolving breech, containing seven chambers, brought in succession into position, by the single movement of elevating the hammer. I sent it to the exhibition of Irish Manufactures and Inventions, held at the Royal Dublin Society, in May, 1834, where it still remains. It is thus described in the *Dublin Evening Packet*, of the 22d of May :—"In our last notice of this exhibition we described a gun with a revolving breech, capable of being discharged seven successive times within a space of from 25 to 30 seconds; we have just learned that the inventor is a clergyman, living in the county of Tipperary, and that the gun was manufactured in the town of Clonmell."—I would here observe, that it has been suggested to me by military persons that the principle of the above invention would apply with great effect to cannon.*

II.—I would in the next place submit a project directed to the increase of power applied to draught.

The means which I would suggest for the attainment of this object are, a new formation of road, by which wheels *of any diameter*, that it may be found convenient to use, are rendered applicable to draught, without destroying the proper direction of the line of traction. I propose to give what I shall term the power-road (or that on which the power moves, whether it be steam or otherwise), an elevation above the waggon-road (or that on which the train of carriages moves), proportioned to the magnitude of the wheels which it may be found most advantageous to use. Assuming that the power attained from the application of wheels of different magnitudes moving on ordinary roads, varies in the direct ratio of their semi-diameters, an elevation of three feet in the power-road would double the power, inasmuch as it would render applicable wheels of double the diameter that would apply with effect on an ordinary road. I am aware the advantage obtained on a rail-road, by the application of this principle, is not so considerable; I calculate that the comparative powers of wheels of different magnitude, on a rail-road, vary as the square roots of the semi-diameter of the wheels. An obvious advantage, exclusive of the increase of power, resulting from the above construction of road would be, its rendering an upset impossible.

III.—The next project I would submit, is directed to obviate an inconvenience (much dwelt on in a late number of your publication), resulting to carriages impelled by steam, and *moving on common turnpike-roads*, from the inequalities or ruts of unavoidable occasional occurrence in roads composed of ordinary materials. I would have each axle furnished with two wheels additional, and exterior to the main wheels, and *of somewhat smaller diameter*. These additional, I shall term relief-wheels. The effect of this contrivance must, I conceive it is obvious, be, to relieve the carriage from any shock from inequalities in the road, *except* when a depression or rut presents itself *at the same moment* to a main wheel and corresponding relief-wheel, which, it is obvious, except on roads in *total disrepair*, would be of extremely rare occurrence.

I beg to apologise for the extent to which this communication reaches, and am, Sir,

Your obedient servant,

R. C.

Donoughmore Glebe, Clonmell,
25th Jan. 1835.

* We should be glad to receive from our worthy correspondent a more particular description of this ingenious invention. A drawing is also very desirable.—*Ed. M. M.*

MERCURIAL GAS-HOLDERS — WEEKES'S EUDIOMETER.

Sir,—Residing, as I do, remote from the metropolis, the Mechanics' Magazine reaches me, at best, not more frequently than once a month, and occasionally not so often—hence the paper on "Mercurial Gas-holders," at page 232 of your present volume, by our friend Henry Watson, of Chichester, did not come under my observation until this day. Your correspondent has done me the honour to adopt an idea of mine in the leading principle of his apparatus, and, which is somewhat more uncommon, he has exhibited the genuine spirit of a man of science, by acknowledging the source from whence it has been derived. It would be mere affectation to pretend that I am not gratified by H. Watson's remarks, and I shall secure to myself the pleasure of tendering him, as I believe, a few useful hints in return. He states that he intends to introduce the gases into the tube of the eudiometer he is now engaged in

constructing, by an orifice similar to the one suggested in the "Mercurial Gasholder;" and he says, "chiefly because I fear to spoil my eudiometer by attempting to drill a hole through its crown." Let him dispel his fears, for if he will adopt the following simple plan he will find them groundless. Take a *small sized* graver, such as is used by watchmakers in turning their brass-work; let it be brought to a good but very fine point, by friction on an oil-stone, and, having determined on the centre of the crown of his detonating tube, by giving to the graver a rotary motion with the fingers of one hand, while he holds the tube firm with the other, keeping the graver perpendicular, and at the same time not bearing too hard; and H. Watson, in the space of a few minutes, will have a perforation suited to his purpose, with very little, or none at all, of risk or difficulty. From what I have experienced in the use of various apparatus connected with the explosion of gaseous mixtures, I am apprehensive that a cork plug to the eudiometer will not invariably resist the explosive force which occurs at the instant of decomposition, unless the said cork be secured in its place by means of a screw-cap. The stop-cocks of my eudiometer, of which you lately published a description, have been frequently exposed to the action of mercury, ever since the beginning of the year 1828: they are, notwithstanding, uninjured. A very moderate coating of thin sealing-wax, copal, or elastic-gum varnish, poured through the air-way of the stop-cocks, or applied, by means of a small brush, to any metallic surfaces, I have always found an efficient protection against the action of mercury. I would suggest to H. Watson, that by omitting to perforate the crown of his eudiometer, and abandoning the use of stop-cocks, he will lose in the employment thereof one of the principal advantages contemplated in the construction of my instrument; namely, *the certainty and ease* with which any precise quantity of gas required may be introduced into the tube of detonation, or let off therefrom, if necessary to be corrected after its introduction. I think that every practical chemist will perceive that a perfect command over exact quantities, during an analysis, is a feature of *no small importance*; and I doubt if it *be possible to* transfer gas from one tube to another by the ordinary mode, with any approximation to a similar degree of accuracy.

The communication of your correspondent H. W. has reminded me of a mode of constructing mercurial pneumatic troughs, which, during some years past, I have practised with great advantage to myself, inasmuch as they can be thereby readily obtained at a more trifling expense; are durable, easily kept clean, and without difficulty may be made to any desired form. If you approve, I will, at an early opportunity, forward you a paper on the subject.*

I am, Sir, with much esteem,
Yours,
W. H. WEEKES.

High-street, Sandwich, Feb. 5, 1835.

DR. WOLLASTON'S CAMERA LUCIDA AND BURGESS'S PANEIDOLON.

Sir,—In a recent work of Captain Sir F. Head's, a passage occurs eulogizing a drawing instrument, called Burgess's patent paneidolon, in opposition to Dr. Wollaston's camera lucida.

Now, having seen and used both these instruments myself, while duly estimating the utility and capabilities of the paneidolon, I am anxious, through the medium of your widely circulated Magazine, to place before your readers the claims to preference which the camera lucida, on the whole, demands; a statement, the truth of which will, I think, appear sufficiently clear, when I shall have candidly discussed the comparative merits of both instruments.

As the camera lucida has now been invented for some years, its construction is perhaps too generally known to require description. The principal feature of the paneidolon is an upright pane of glass, upon which the outlines of the objects seen through it can, with the head kept steady, be traced in true perspective. This, however, is nothing more than what was well known, and could be applied ages ago. The new invention consists of a piece of fine gauze stretched close to the glass, which without obstructing the view, enables any one easily to draw upon it with a common pencil. The glass and gauze slip into a square box on the side nearest the object to be taken, open at

* We need scarcely say that we shall be very glad to receive it.

the opposite side, and fixed upon a firm stand about five feet from the ground. The sides of the box, at right angles to the glass, steady the spectator's head, which he places within the box, and thus looking through the glass (the least motion of his head being prevented) he is capable of tracing an accurate perspective outline of the objects before him. Having finished the drawing upon the gauze it is necessary to remove it, and apply it to a blank piece of paper, on which the drawing must be again traced through the gauze along the former lines upon it. Thus the drawing, as far as the paneidolon is concerned, is completed.

I come now to mention the advantages of the paneidolon, which the camera lucida does not possess.

1st. The pencil is drawn along an outline of the objects themselves, not along their reflection, which, with the camera, unless it be properly adjusted with regard to the objects before it, becomes distorted.

2d. The pencil point which traces can be seen more distinctly, since nothing intercepts the sight, so that the situation of the object being drawn, and the pencil that traces the object can never be mistaken, even by those unaccustomed to drawing and the use of the instrument.

3d. The paneidolon can be moved from its situation before the drawing is finished, and the exact point easily regained upon resuming the copy; whereas the camera once moved from its first position, the former points of the objects that are being drawn can only occasionally be obtained, and that perhaps with some difficulty.

4th. The eye not looking through a small hole, as in the camera, is less fatigued by the use of the paneidolon, there being very little more strain upon the eye than when engaged in sketching or copying any thing in the common way. This last reason is the only one, and that perhaps the most invalid of all, which Captain Head brings forward in favour of the paneidolon.

I will now state the advantages which the camera lucida possesses over the paneidolon.

1st. Its convenient size; the brass rod, *cramp, and prism, of which* it is composed, occupying altogether so small a space, as to admit of three or four pencils, India-rubber, and a knife, being packed up with it in a pocket-case; whereas the paneidolon must be seen to be a very inconvenient instrument, not to carry in the pocket, but to carry at all.

2d. The use of the paneidolon, for a drawing on paper, for an *available* drawing, involves two operations; viz. the tracing the objects on the gauze, which, by the way, must be renewed every fresh drawing, and the tracing the lines, which are on the gauze, through on to the paper; with the camera a correct and clear image of the objects is cast on the paper, which at once receives the impressions from the pencil.

3d. The camera enables a person not only to make an accurate copy of oil paintings and engravings of all sizes, but also to enlarge and reduce them to any reasonable extent: capabilities which the paneidolon does not possess; or, if at all, in a very limited degree.

4th. The camera can be applied to a microscope, so as to cast images of magnified objects on paper, so clearly as not to escape the smallest details.

5th. The camera is a far cheaper instrument than the paneidolon; the former costing 24*s.*, the latter 4*l.* or 5*l.*

6th. The camera is available in drawings twice the size of that allowed by the glass and gauze frame of the paneidolon.

Having now stated, as correctly and candidly as I am able, the particular advantages of each of these instruments, it has been my intention to show that both of them are highly useful; but that of the two, the camera lucida, from its numerous capabilities, is greatly to be preferred. Nor can the elegance, the compactness, the convenient smallness, or the scientific character of the camera lucida, by which Dr. Wollaston has produced, notwithstanding its size, such a variety of results, be lost sight of, as a kind of charm imparted to the instrument; the superiority of which I have been endeavouring, and trust I have not failed, successfully to advocate.

I beg, respectfully,

To subscribe myself,

ONE DESIROUS OF SEEING TRUE MERIT TRIUMPHANT.

REPORTS OF MR. VIGNOLES AND MR. LOCKE, C. E., ON THE PROJECTED NORTH LINE OF RAILWAY BETWEEN LIVERPOOL AND MANCHESTER.

We gave in our last Number an abstract, with which we had been favoured, of the Reports of Messrs. Vignoles and Locke on the new line of railway projected to be formed between Liverpool and Manchester; but so far only as regarded the local question at issue, namely—the expediency of executing such a line. Since then the Reports themselves have been published entire;* and on perusing them we find so much valuable information, of a nature applicable to all railways, mixed up with the local question, that we need offer no apology for recurring to these documents, in order to do fuller justice to them in their general bearings. There is a great deal of talent and practical knowledge shown in both Reports; and so perfect an agreement between them, as to entitle the opinions they contain to more than ordinary respect.

Mr. Vignoles states, that in calculating the cost of executing the New Liverpool and Manchester Line, he has adopted for the transverse sections of the road the same areas which he used upon the Wigan Railway, and is adopting on the Preston Line now in progress, and which have been also taken for the Grand Junction Railway between Birmingham and Liverpool; that is to say, for cuttings when they exceed 20 feet slopes, of 2 to 1, and when of less depth 1½ to 1—for embankments when they exceed 50 feet 2½ to 1, and when of less elevation 2 to 1. "I have found from experience (he says) of the nature of the soils in the vicinity of the coal measures, that it is necessary to give slopes of two horizontal to one perpendicular, when the depth of excavation exceeds 20 or 30 feet." Mr. Locke thinks, that "in excavations, similar to those on the projected North Line, varying from 50 to 100 feet deep, and extending for several miles, it is difficult to fix the slope at which the sides *would not slip*;" but presuming that "some portion of the material will be rock, in which the sides may be made steeper, and the remainder clay, sand, or marle," he concurs with Mr. Vignoles in taking 2 to 1 as the proportion for all cuttings more than 20 or 30 feet deep.

The cuttings are estimated on these data to amount to 11,267,767 cubic yards; and as the length of the new line is 31½ miles, this gives 357,706 cubic yards per mile, which, as will be seen from the following comparative table, greatly exceeds the quantity of cutting in any line yet constructed or projected in Great Britain.

	Cub. Yds. per Mile.
Liverpool and Manchester Railway (Stephenson, Sen.)	100,000
London and Birmingham do. (Stephenson, Jun.)	108,000
Grand Junction do. (Stephenson, sen., and Mr. Locke)	70,000
London and Southampton do. (Giles)	200,000
St. Helens do. (Vignoles)	50,000
North Union do. (Vignoles)	140,000
London and Brighton (Vignoles)	200,000
Grrnd Western Branch do. (Brunel, jun.)	70,000
Projected North Line	357,706

The embankments are estimated on similar data, to amount to 5,713,026 cubic yards, including 10 per cent. for consolidation, which also greatly exceeds the quantity on any of the other lines above-mentioned.

With respect to the *time* which would be required for the execution of these prodigious quantities of earth-work, Mr. Vignoles makes the following interesting calculations:—

"The embankments being formed from the cuttings, it is known, from long experience, that only a limited quantity can be teamed or shot down from the waggons daily. The utmost that the best regulated exertions have yet accomplished at one end or face of an embankment, within my experience or information, has not amounted to 1,000 cubic yards per day; and such a quantity can only be transported over long distances, by a great capital invested by the contractor in extra lines of rails, in waggons, and other materials, in horses, and in overseers' wages. Neither can this amount be estimated upon for more than five days in the week, as one day must be allowed for bad weather, idleness, and disorder on the part of the men, and other contingencies. Thus 260,000 cubic yards is the limit of a year's work at one end of an embankment. The embankment, seven miles in length, from the Hindley turnpike-road to Garrett Mill,

* Two Reports addressed to the Liverpool and Manchester Railway Company on the projected North Line of Railway from Liverpool to the *Manchester, Bolton,* and Bury Canal, near Manchester, *exhibiting* the Extent of its Cuttings and *Embankments*; with Estimates of the Cost of Completing the said Railway. By Charles Vignoles, Esq., C. E., and Joseph Locke, Esq., C. E. *Liverpool: Wales* and Baines. Pp. 32 8vo.

require, including a moderate allowance for consolidation, upwards of three millions of cubic yards, of which one half would have to be carried to that portion of the valley of the Leigh canal nearest the Ashton and Billinge cutting: and at the above daily rate it would require six years to accomplish these two miles of the western end of the embankment. If the eastern end is to be going on at the same period, the material must be brought from Pendlebury, and waggoned a distance of from six to eleven miles. In any case, a million, or a million and a half, of cubic yards would have to be conveyed seven and a half miles, and upwards of five millions thrown into spoil. I am not able to perceive how this portion of the line could be opened entirely for traffic under a period of seven or eight years from the passing of the Act, unless the face of the county be covered by additional millions of yards of excavations, run into spoil bank; an equal quantity of earth being obtained from side cuttings to a great depth; gaining time at an expense which I do not pretend to calculate.

The deep cuttings at Billinge and Irlam, the materials of which would have to run into spoil, may be in some degree judged of by those persons who have seen the heavy excavations near Birmingham, for the Old Birmingham canal, executed for lowering the summit level. A judgment also may, from that work, and from the great embankments on the Liverpool and Birmingham Junction Canal, be made by persons not professionally engineers, of the increase of the expense of bridges, culverts, and masonry, when the cuttings and bankings are laid out on so great a scale, especially where the bridges cross obliquely."

Mr. Locke's remarks on this head are also well deserving of attention:—

"The time required for executing works of this description depends on the facility of applying labour over a large space; where this can be done, a long cutting may be made as expeditiously as a short one. A large excavation may be made by working at intermediate points, as well as at the extremities; but an embankment can only be formed at the two ends, and its progress will therefore depend on the facility with which earth from the adjacent cuttings can be supplied. The embankments on the projected North Line, as has been stated, do not much exceed one-half the excavations, yet it so happens that the former will require the longest time in making. One embankment, from 15 to 60 feet high, is 7 miles long, and *will require nearly 3¼ millions* of cubic yards, *and even with very great exertion will take 7 years to complete it.* You are no stranger to *the activity displayed in* making the Broad Green Embankment, which was the greatest work on the Liverpool and Manchester Line;—the inducements and rewards given by the Directors, and the almost total disregard of cost, for the purpose of saving time; and yet this embankment does not contain one-fifth of 3¼ millions, notwithstanding which 3 years were required for its formation. (I calculate on 250 working days per annum, and 1,000 cubic yards per day brought to each end of the embankment; this continued for 6½ years will give $250 \times 1000 \times 2 \times 6\frac{1}{2} = 3{,}250{,}000$ cubic yards, and to this I add 6 months for preparation, finishing off, and laying permanent rails.)"

The objections to the new Line, on account of the great elevation of its summit level, and the deductions which require to be made from the productive capabilities of all railway lines, on account of the heights to which the weights transported have to be raised, are well stated by Mr. Vignoles in the following extracts:—

"On the projected Railway, the locomotive engines would start at a point about 29 feet above the Dock Quays, and have to overcome a vertical rise of 151 feet, making the summit level about 180 feet above the Dock Quays of Liverpool.

"On a well-kept Railway, and with the wheels of the carriages in proper order, we may take the friction at 9 lbs. to the ton upon a horizontal or perfectly level line: to this must be added the retarding power of gravity upon ascending planes, which may be readily found by dividing the number of pounds in a ton by the rate of inclination.

"On applying these rules, it will be found the proposed North Line of Railway has the levels graduated in such a manner, that for many parts of the distance between Liverpool and Manchester a locomotive engine, can draw very little more than half her load, and only about three-fifths of the load which the engines on the present Liverpool and Manchester Railway could now take throughout that line, except the one-twentieth portion thereof (one mile and a half) on the inclined plane of Whiston or Sutton.

"Without entering into any elaborate calculations as to the difference of power required, I may state briefly, that the traffic is carried by one extra locomotive engine constantly attending each of these planes; that is, two additional working engines; and admitting two others to be constantly under repair, the increased expense is four locomotive engines, out of an establishment of about thirty-two, say one-eighth of the whole.

"On the proposed new Line the inclined planes are so long, and the intermediate be

ter levels so placed, and of such extent, that additional engines to assist could not be economically applied. And it is therefore evident to every one accustomed to consider the subject, that if this Line should be executed, the engines could scarcely do half their work, with the additional disadvantage of being liable to considerable retardations on the long ascents, in cases of slight accidents to the engines, which are not felt on the easy gradients of the existing railway; whereon a locomotive may, and often does work with one cylinder, when the other is casually out of order.

* * * * *

"The locomotive engines on the Liverpool and Manchester Railway start at an elevation of 123 feet above the Dock Quays, and have to overcome a vertical rise of 81 feet to the summit, all the rise being, however, concentrated on the inclined plane, which is attended by an assistant engine.

"Hence, it is evident, that the locomotive engine of the intended new Line would have to overcome a greater rise, by about 70 feet, than the engines have now to do on the Liverpool and Manchester Railway, and that under circumstances which admit of no additional help being given to them, with any possible degree of economy. It also appears that the summit level of the North Line, although in 106 feet cutting, would be fully as high above the Dock Quays of Liverpool as the present Railway summit is.

"I can have no hesitation in stating, even taking into account the inclined planes of the Liverpool and Manchester Railway, that it would require fully one-fifth, and probably nearly one-fourth additional locomotive power to do the same work, at the same speed, on the intended "North Line;" and that the liabllity of delay to goods and passengers would be much increased by petty derangements of the engines, slipping, &c., or putting on additional coaches or waggons, in casses of emergency; since upon inclinations of 14 to 17 feet per mile, the engines would be working up to their full power nearly, which, on the Liverpool and Manchester level, is not the case generally.

"The cost of an establishment of locomotive engines, including repairs and renewals, is about 1,000*l.* per engine per annum, working with heavy trains, and at high velocities; and consequently the additional cost of locomotive power on the proposed North Line would be from 7,000*l.* to 8,000*l.* a-year above what it would cost upon the Liverpool and Manchester Railway, taking no account of the increased distance of three miles."

Mr. Locke, in order to show still more clearly the mechanical disadvantage of working a railway with so high a summit level, has been at the pains to calculate "the proportionate amount of power required to drag one ton of goods from Liverpool to Manchester, by the line now projected, and by that already existing." The results are curious and instructive.

"It will be apparent that the resistance on a railway is generally composed of two elements—friction and gravity; and the power required to overcome this resistance will, in ascending, be equal to the sum of these elements, and in descending, to their difference. The aggregate amount, also, of mechanical force expended on a railway is equal to the sum of the products of the resistances, and the respective lengths of the planes. If, therefore, we multiply the lengths of the planes by the resistances offered in each, we shall obtain a number that will represent the whole mechanical force required on the Line, and a standard by which any other Line may be compared. On this principle, I have made the annexed tables of comparison:—

"The length from the junction of the projected Line with the Bolton and Bury Railway to Manchester, I have assumed to be 2½ miles, and descending at the rate of about 10 feet per mile. I have not had very accurate means of ascertaining this, but believe it to be very nearly the true distance.

"TABLE,

Showing the length, inclination, and resistance on each of the planes on the Line of the projected North Railway, and the number of lbs. which, hanging over a pulley, and moving through a space of 66 feet, will convey one ton of goods from Liverpool to Manchester. Friction taken at 9 lbs. per ton.

Length in chains.	Rise in feet.	Fall in feet.	Rate of inclination.	Resistance in lbs.	Total resistance in lbs.
0	22	..	Perpendicular rise at Liverpool.	2240	746⅔
40	..	..	Level	9.00	360
207	30	..	1 in 455	13.92	2881½
183	..	10	1 in 1208	7.15	1308½
250	56	..	1 in 294	16.62	4555
160	12	..	1 in 880	11.55	1848
368	64	..	1 in 380	14.89	5479⅓
432	..	76	1 in 375	3.03	1309
240	..	..	Level	9.00	2160
240	47	..	1 in 337	15.64	3753½
207	..	..	Level	9.00	1863
193	..	42	1 in 303	1.61	310¾
2520	..	..	....	..	26175½
200	Distance from the junction of the Bolton and Bury line to Manchester.		1 in 500	4.50	900
2720 or 34 miles.	231	128	Average resistance..	10.06	27075½

"TABLE,

Showing the same from Crown-street and from Wapping to Manchester by the present Railway.

	Length in chains.	Rise in feet.	Fall in feet.	Rate of inclination.	Resist. in lbs.	Total resistances in lbs.
	43	..	..	Level	9.00	387
	418¾	..	25½	1 in 1094	6.95	2910
	117¾	80½	..	1 in 96	32.33	3807
	150	..	..	Level	9.00	1350
	112½	..	83	1 in 90	..	..
	201½	..	4⅝	1 in 2858	8.22	1656
	528	..	39⅓	1 in 883	6.46	3411
	450	22¾	..	1 in 1300	10.72	4824
	340	5½	..	1 in 4257	9.52	3323
Result from Crown-st. to Manchester.	2370½	108¾	152½	Average resistance.	9.14	21,668
Add Tunnel & Wapping Station.	15	..	..	Level	9.00	135
	90	123¼	..	1 in 48	55.66	5,009
Result from Wapping to Manchester.	2475⅛ or 30 7/8 miles.	232	152½	Average resistance	10.83	26,812

"If, instead of adding the old Tunnel, we add the new one from the Cattle Market, then for the number 26,812 we shall have, 21,668 × 3076 = 24,744. To place these results together, viz.—

From Crown-street to Manchester . 21,668
Wapping to ditto 26,812
Lime-street to ditto 24,744
Add by the projected North Line 27,075

And from which we find that the latter is worse than the Line from Crown-street by 20 per cent., from Wapping by 1 per cent., and from Lime-street by 9 per cent.

"It also appears that on the present Line from Crown-street to Manchester (about 29⅛ miles) the average resistance is 9¼ lbs. per ton, which very nearly corresponds with a dead level; and on the newly-projected Line (about 34 miles) the resistance is about 10 lbs., which is equal to a rise of about 2¼ feet per mile for the whole distance. This view of the case is of some importance, showing as it does, that notwithstanding the inclined plane at Rainhill, the aggregate amount of power required from Crown-street to Manchester is very little more than it would have been had the Line been perfectly level.

"It is not, however, the only way in which the question should be considered; for although a Line in the aggregate may be favourable, it is nevertheless desirable to avoid any partial inequality in the levels; for it is necessary that every engine should be powerful enough to overcome the resistance on the greatest inclination it may have to surmount. Suppose an engine that on a level is able to drag 200 tons; it will on an inclination of 1 in 1,800 (which is the greatest rise from Crown-street to Manchester, setting aside the inclined plane, where the engines are assisted,) drag 168 tons; and if we apply the same engine to the projected North Line, where the greatest rise is 1 in 294, we shall find that it will not drag more than 108 tons.

"This reduction in the load can only be made up by employing an assistant engine on the plane, which, however, would be still more disadvantageous; for the rise of 1 in 294 is nearly 3¼ miles long; and an assistant engine would, in aiding each train, traverse a space of 6½ miles. Besides, there are two other planes 7½ miles long, rising on an average 1 in 360, upon each of which an engine would be required to assist the train, and they would have to traverse a space of 15 miles; thus, then, we should have an assistant engine traversing two thirds of the whole distance to Manchester, in order to save one-third of its maximum load. Nor, in this instance, would one-third be saved; for, besides those enumerated, there are other planes which would prevent the engine from taking that load. It is clear, therefore, that this Line must be worked without assistant engines, and on the previous assumption, each train cannot exceed 108 tons in weight; whilst, on the present Railway, where the inclined plane is only 1¼ mile long, the assistant engine in each trip, itself traversing a space of 3 miles, enables the train to be loaded to the extent of 168 tons; and this addition of 60 tons, which is more than one-third of the whole load, is obtained at the cost of an assistant engine, traversing only one-tenth of the whole distance.

"The above view of the case admits of some modification. Trains may be despatched frequently with such loads as to enable the engines to surmount the greatest plane; after which they may travel with greater ease, and thereby reduce the consumption of fuel. Assistant engines are a constant expense, without the certainty of a constant trade. These considerations might, under certain circumstances, have some weight; but when an uniformly great trade is to be carried on, their importance ceases."

We have but room for one extract more, relating to the item of masonry; it is from Mr. Vignoles' Report:—

"The masonry of a public work is always increased with the excavations and embankments: looking at the section of the projected Line, and observing the number of bridges and their position, over deep cuttings and through high embankments, it is certain the expense for masonry of all kinds will greatly exceed in cost per mile any railway hitherto executed or projected. The crossing

for the intended Railway, over the valley of the Leigh Canal, including the public roads, Canal, Wigan Railway, and Colliery Tram Roads, will require an expensive viaduct; the various properties and streets laid out along the North Shore, at Liverpool, will demand numerous archways, and the occupation bridges over the deep chasms in Billinge and Pendlebury, will be very costly. The bridges on the old Birmingham Canal, over the deep cutting, cost several thousand pounds each. The cost of the masonry on that portion of the North Union Railway just let to respectable contractors, is more expensive per mile than that upon any of the existing railways, independent of the Ribble Bridge; and from a comparison of the sections, it will be found that the proportion of excavations on this Line to that on the projected North Line, is as 4 to 10:—the total on that part of the North Union Railway, for 15¼ miles, being two millions of cubic yards; and for the projected North Line, for 31½ miles, being 10 or 11 millions."

The Reports do altogether great credit to their authors, and ought to be in the hands of every railway-engineer.

PLANS FOR THE CONDENSATION OF THE STEAM IN CONDENSING STEAM-ENGINES—MR. HALL'S—MESSRS. BUSK, KEEN, AND CO.'S.

Sir,—In No. 586, Mr. S. Hall gives an account of an improvement in the steam-engine, for which, he says, he has taken out nine patents, in England, America, and the continent of Europe. This invention consists in condensing the steam from the working cylinders and the safety-valves, so as to work the same water over and over again in the boiler; by which means the latter is kept free from any deposit or incrustation of salt, or other impurity whatever. The great advantages of this method are obvious, and not at all exaggerated in Mr. Hall's enumeration of them.

Mr. Hall describes his object to be obtained by causing the waste steam to pass through a bundle or cluster of numerous small tubes of thin copper, enclosed in a kind of box or drum, through which a stream of cold water is constantly flowing. I should be sorry to detract in any way from Mr. Hall's, or from any other man's merit; and it is *only an analogous feeling* which induces *me to request you* will give publicity to *the following facts.*

I well remember that, in 1826, two or three engines, with tubular boilers, were constructed at the steam-engine manufactory, Regent's-park, intended to propel certain vessels on the river Garonne, both above and below Bordeaux, consequently in salt water. An apparatus for condensing the steam, and using the same fresh water, over and over again, constructed precisely in the manner described by Mr. Hall, was attached to each engine, and perfectly succeeded. The ingenious Mr. Wm. Keen, now partner of Mr. Wm. Busk, of No. 6, Bankside, directed the construction of these engines and condensing apparatus, and I also assisted. Mr. Keen took these same engines to Bordeaux, where he has ever since been, and still is, engaged in running several steam-vessels, provided with a steam-condensing apparatus, similar to that described by Mr. Hall, with very great success.

While on the subject of condensing the steam, for the purpose of using the same water over and over again, I must not forget to mention, that Dr. Church, of Birmingham, the patentee of a very magnificent steam-carriage, when showing me over his works, last August, with the greatest politeness and unreserve, drew my attention to a very ingenious contrivance of his, by which he condenses steam of one hundred pounds' pressure, by the cooling effect of *the atmosphere alone!* And, moreover, he has managed to bring it within such a compass, as to have actually applied it with success, as he informed me, to his *common road* steam-carriage! I should much like to give you a description of this contrivance; but I am not aware how far such publicity might be agreeable to Dr. Church. I am, &c.

FRANCIS MACERONE.

8, Upper George-street, Bryanston-square,
Nov. 2, 1834.

PEDESTRIAN TUNNELS.

Sir,—As the Mech. Mag. is one of the great means available for general information on the subject of useful projects, I wish to offer a plan which I conceive would be a great improvement to the metropolis, and very advantageous to the public. I propose that moderate sized tunnels, with steps to descend into

them, should be made under the principal crossings of some of the great streets; such as Cheapside, Newgate-street, Ludgate-hill, Regent-street, Charing-cross, Oxford-street, Fleet-street, &c. Crowded as some of them are every day with omnibuses, cabs, and all sorts of carriages, it is really a service of danger to get across in many places, and many accidents happen in consequence, which are daily published in the newspapers, and many more, no doubt, which we never hear of. To afford, therefore, security to foot-passengers would be a great public benefit, and no means present themselves to my mind so effective as the use of tunnels. To prevent nuisances a policeman should be always on duty in each tunnel, and they might all be closed by doors at night.

I am, Sir,

Your obedient servant,

D. C.

Marylebone, Jan. 19, 1835.

NAVIGATION OF CANALS BY STEAM.

Sir,—In No. 596 a steam-boat propeller is suggested by your correspondent J. L. S., on which suggestion I made some remarks in No. 598. On Wednesday the 28th of January (last month), at about two o'clock, P. M., I saw a canal-boat propelled along the Regent's Canal by means of a propeller, similar to that proposed by J. L. S. The boiler was of a construction similar to the Manchester railroad boilers, being a cylinder of about 18 feet long by six in diameter. The power of the engine, I should think, would be called 16-horse power; the stroke of the rod, on which were the "flappers," only about 3 feet; number of strokes per minute about 60; utmost speed of the boat 3 miles per hour; the cargo, the boiler, engine, and 7 men; boats drawn after it, none. The boat was marked No. 16, R. Mills, the Francis. I should think that the above will be sufficient indication to J. L. S., to enable him to discover where the boat may be seen, should he have that desire.

I have the honour to be, Sir,

Your obedient humble servant,

FRANCIS MACERONE.

London, Feb. 2, 1835.

NOTES AND NOTICES.

Improvement in Railway Carriage Wheels.—In the last Annual Report of the Baltimore and Ohio Railway Company, there is the following passage:—"Besides the improvements in the locomotive engine, others have been made in the machinery used by the Company, and particularly in the wheels of the cars—by which an iron rod is introduced into the wheel when cast, which not only adds to the hardness of the surface by perfecting the chill, but increases in a great degree the safety of the wheel itself." The improvement here alluded to is the invention of Mr. Dean Walker. The "iron-rod" or hoop is of half-inch *wrought-iron* wire, and enclosed in the rim of the wheel at the time of casting.

Extraordinary Rise of a Fish Pond.—The following is an extract from a letter of a correspondent of the *Cambridge Press*:—"Having just arrived from Home Lacey, in Hertfordshire, I take the opportunity of sending this account of a curious occurrence that happened there on Monday last. A pond in my uncle's grounds all at once rose to an immense height, so as to completely overflow a great part of the garden and meadow. The gardener said he heard a rumbling noise; the butler and gamekeeper said the same thing; but I did not hear it. The fish were driven out of the pond, which, on putting in my hand, I found to be quite warm. In the course of the afternoon, the pond returned to its usual state, but is five feet deeper than it was before, clearly proving that the bottom of the pond has sunk."

Useful Hints to Gas Consumers.—An Argand burner, of three quarters of an inch in diameter, was supplied first with gas enough to produce a light equal to one mould candle; and with this light nearly a foot and a half of gas was consumed in one hour. More gas was then admitted, until the light equalled that of four candles; and with this great increase of light the consumption of gas was under two cubic feet in the hour. Consequently the cost of light in the first instance was a foot and a half of gas per candle, and in the second half a foot, or three times as cheap. The experiment was then continued until the light was equal to that of ten candles. When more gas was admitted the light became smokey, and the experiment was carried no farther. All persons who burn gas by meter are interested in the result of this experiment; if they wish to economise, they should get all the light they want from as few burners as may be convenient, and when they wish to diminish their light, this purpose would be effected by extinguishing one or more lamps, instead of lowering the gas at all. In this manner the greatest light will be obtained at the least possible cost.—*Bury Post.*

Philosophical Pedlar.—In a solitary road of Upper Virginia, I was attracted by the appearance of a Yankee pedlar, who, with great enthusiasm, recited verses from a copy of Virgil, descriptive of a scene similar to a very striking one then before him. I naturally inquired into the history of such an individual so engaged. He informed me that his father had given him a good classical and philosophical education, and had brought him up to the business of a tinsmith. At this trade he had worked assiduously for many years, during which he had beguiled his hours of leisure by classical reading. "Virgil, sir," said he, "is my favourite author, and I never go on a journey without him. He is good company. He shortens the way, enlivens an evening or a rainy day at a tavern, and enables me to bear better the usual adversities of my diversified life. I make my tins myself, harness my horse, load my waggon, and journey here and there in the south to sell them." Here you see that a classical scholar, a man of taste—

fact, a cultivated philosopher, was not ashamed to pursue a very common mechanical business, and he did it with skill and attention.—*Address by Dr. Mitchell to the Franklin Institute, on the means of elevating the character of the working classes.*

The Steam-Carriage Company of Scotland have brought an action of damages against the Trustees of the turnpike road between Glasgow and Paisley, for having compelled them to give up running on that road (after doing so with great success for several weeks continuously) by "wantonly, wrongfully, and maliciously accumulating masses of metal, stones, and rubbish, on the aforesaid road, in order to create such annoyance, hazard, and obstruction, as might impede, overturn, or destroy the steam-coaches belonging to the pursuers (plaintiffs)." The summons or declaration states, that the hostility of the defendants was carried to such a pitch, that they made the road not only impassable for steam-carriages, but nearly so for carriages of every description. "The ordinary horse-carriages running upon the road were also much injured, and the heavy carts and waggons usually plying between Glasgow and Paisley were obliged to desert the said road, and to go round by a different and a longer route." The damages are laid at 30,000*l.*!

Cements.—Mortar made of good lime and clean sharp sand may be successfully employed for the same purposes as Roman cement, provided it be allowed sufficient time to dry before water is permitted to rest upon it. This was mentioned many years ago by Arthur Young, in his "Agricultural Survey of Lincolnshire," and we have seen it proved in a variety of instances. In stuccoing the front of a house in or about London, for example, no builder need ever have recourse to any of the metallic cements, including under this term *Roman cement, Parker's cement, Hamblin's mastic,* and all other quick-setting cements (which are only quick-setting in consequence of their containing some metallic oxide), provided he can procure the best stone lime from Dorking or Aberthau. For our own parts, we should have more confidence in the durability of stucco so formed than in that of any of the cements.—*Mr. Loudon, Archit. Mag.*

Fall of a Suspension Bridge.—The beautiful suspension bridge, which crossed the Garonne at Porte St. Marie, by a single span, gave way at four o'clock on the morning of the 8th of Jan. last, and was nearly entirely destroyed.

It appears by a letter written by the Marquis de Cinq-Mars, in the reign of Louis XIII., by the celebrated Marion Delorme, that a man, confined in the Bicetre by the Cardinal de Richelieu, as a monomaniac, had discovered in the application of the steam of boiling water a substitute for the power of man and the force of water in directing various operations. Marion Delorme saw this pretended madman, during a visit which she paid to the Bicetre *in company with the Marquis of Worcester*, who is always considered in England the first discoverer of steam. We are ignorant whether this letter has been proved to be authentic.—*Courier Francais.*

The Manual Labour Academy, of Maury county, Kentucky, which was opened four years ago with only seven pupils, has been formed into a college, under the title of Jackson College. The trustees own 310 acres of land, with substantial buildings for the accommodation of 72 students, and they are now erecting other buildings. One hundred and sixty applications for admission were made *during the last year.* Two hours' labour a day are *required from each student*, and 10*l.* in addition to *this will pay for his board* and tuition. Donations *are now solicited for the* purchase of a library, philosophical apparatus, and the endowment of a professorship.

The Birmingham Town-hall is a noble edifice—look at it from any of the five lines of approach when you will. Seen under a very clear sky it is silent glory and beauty; and in the bright light of the moon—but more so when the clear moon is now dark'd, now flashed out again suddenly, by the rapidly-scudding black storm-clouds—it is, of all the buildings I remember in this kingdom, the most thought-suggestive. * * * I believe there is not any building in England that can exhibit such a glorious range of columns. Afar off they attract—near, they fascinate the gaze. Get into an angle with the eastern line of them, and they become countless, calling up a fancy of 'there are thousands more,' only your vision is too weak to trace and follow the line. Stand at a distance, and look to the roof; the sky and it are associated; they are mighty and graceful dwellers together. The fabric is a splendid poem."—*Pel. Verjuice.—Monthly Rep.*

Magnificent Railway Viaduct.—We observe, from the Liverpool newspapers, that the North Union Railway Company have contracted with Messrs. Henry Mullins and M'Mahon, of Dublin, for the erection of a bridge or viaduct over the Ribble, which is to consist of five noble elliptical arches, of 120 feet each, being almost a fac-simile of the Waterloo bridge over the Thames. "The design," it is said, "was at first thought too expensive and elaborate; yet careful investigation, and the opinion of the most experienced bridge builders and masons, not only confirm the original and bold conception of the Company's engineer, Mr. Vignoles, but actually demonstrate that this is the most economical mode of taking a railway at the height of 70 feet across the river." The contract price is 35,000*l.* The North Union Railway consists of two parts; 1st, of the Wigan Branch Railway, 7 miles long, which is already executed, and has been two or three years at work; and 2d, the Preston and Wigan Branch Railway, 15 miles long, which is now in course of execution, and is expected to be completed in three years from this time. Supposing the Birmingham Railway to be simultaneously completed, there will then be a railway communication the whole way from London to Preston.

Communications received from An Eye-Witness—Mr. Frazer—ω.—Mr. Sockle—N. A. N.—P. B.—Utile—Mr. M. Tenby.

The Supplement to Vol. XXI., with a Portrait, on Steel, of the late Mr. Telford, continues on sale, Price 6*d.*; also the Volume complete, in boards, Price 8*s.*

☞ The Editor of the Mechanics' Magazine has made such arrangements as enable him to offer, on unusually advantageous terms, to undertake the solicitation of Patents for New Inventions, the drawing and revising of Specifications, and generally every other branch of Patent business. Drawings of Machines executed with accuracy and dispatch.

6, Peterborough-court, Jan. 3, 1835.

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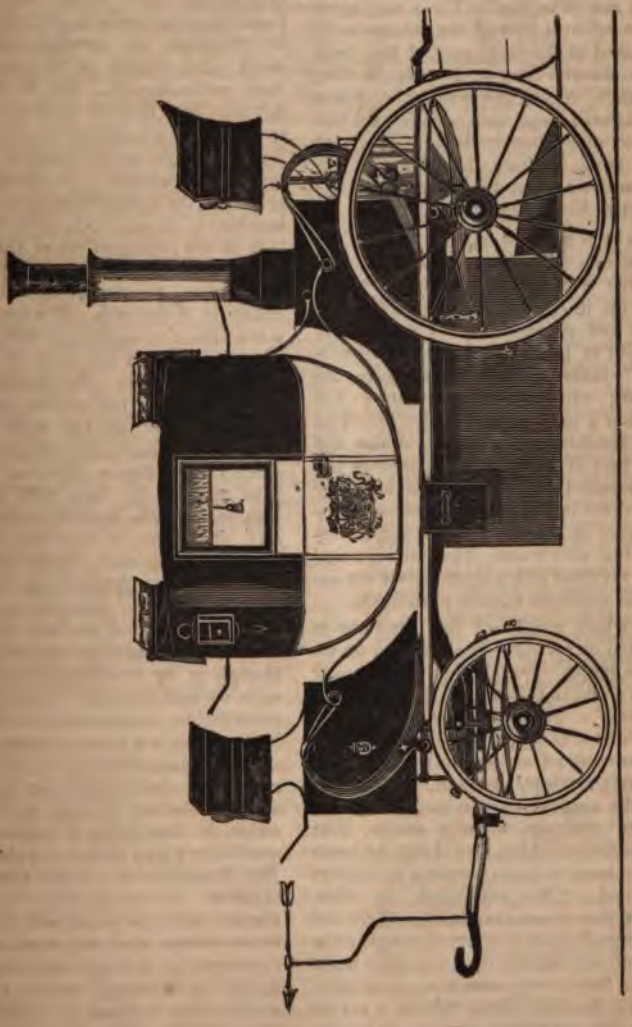
RUSSELL'S STEAM-CARRIAGE.

Fig. 1.



RUSSELL'S STEAM-CARRIAGE.

We present our readers this week with an engraving of a new steam-carriage (new at least to the metropolitan public), which has been running during the last ten days, alternately with another of similar construction, on the Hammersmith road; preparatory, it is stated, "to the opening of a regular and permanent line of communication between London and Windsor." These carriages are (we believe) two of six which were constructed in the early part of last year at the Grove-House Engine Works, Edinburgh, under the patents of John Scott Russell, Esq., and intended for the Glasgow and Paisley Road, but prevented from running there by the obstructions so unjustifiably thrown in the way by the Road-trustees.

In its general appearance, this vehicle is superior to any steam-carriage we have yet seen: it is stated, with truth, to be "fitted up in the style and with all the comfort and elegance of the most costly nobleman or gentleman's travelling carriage;" rather bulky to be sure, as travelling carriages usually are; but altogether a most superb equipage. The steam machinery is placed under the hinder part of the carriage; and in the rear, detached from it, but connected by traces, there is a tender (represented on a large scale in fig. 2), for carrying a supply of fuel and water. The carriage and tender together can accommodate six inside and eighteen outside passengers.

The whole weight of the structure is supported on springs—the carriage on C, and the steam apparatus on grasshopper springs; and in this respect it is supposed to possess a great advantage over all other steam-carriages. Mr. Russell, in his paper on Steam-Carriages in the "Foreign Quarterly Review," written, we believe, before he applied his own hand to steam-carriage making, broadly asserts, that every attempt which has been hitherto made to hang a steam-carriage on springs has failed. "We say failed," he adds, "not on the circumstance that there are no springs, but on the fact that either the whole of the weight does not rest upon them, or that their action is not permitted. In some, the body of the vehicle is set on *springs, but not* the machinery; in others, *the whole is first* set on springs, and then, upon finding their action inconsistent with the other mechanism, they are trammelled and tied down to prevent their bending, or so strengthened, thickened, and shortened, as to be little more than rigid blocks of metal." Mr. Russell even goes further, and asserts, that "imperfect suspension has been the ruin of every machine that has yet been constructed:" thus smashing at once not only Mr. Gurney's well-got-up tale of ruin from the tolls imposed, and threatened to be imposed, on steam-carriages, but every other theory of failure that has been yet suggested. Mr. Russell would not probably find it an easy matter to make good his assertion in its full extent; but there can be no question that "imperfect suspension," or, more properly speaking, the difficulty of suspending the machinery in any way, that will protect it from the jolting effect of the inequalities, common to the best turnpike roads, is, and has, all along, been the master difficulty of the case. We fear, too, that it is a difficulty which no possible arrangement of springs will ever do more than partially obviate. Mr. Russell, in the article we have just quoted, tells us that "the effect of springs *ought to be*, to detach the vehicle and its load from the wheels and axles so effectually, that the jolts received by them *shall not be communicated to the superincumbent weight;* and, unless this be fully and extensively done in every case, future experiments will share the fate of the past." We should be sorry, however, to judge of Mr. Russell's own carriage by this test; it would, in truth, be most unjust: for, though it by no means fulfils the inventor's *indispensable* condition, it is, nevertheless, as promising an affair of the kind as any we have yet seen. To construct a steam-carriage, so that the jolts caused by the inequalities of the road shall not extend beyond the wheels and axles, is manifestly a mechanical impossibility; and of this, we should think, Mr. Russell must, by this time, be fully satisfied. He ought, however, to be well content with the praise which, we think, every person who has seen one of his carriages in action must be ready to accord to him—of having contrived a much better method of suspension, than any hitherto in use in this class of vehicles. It consists, to use the words of

his Specification, in so constructing each spring, that it "shall, in its flexure, describe at a particular point such a circle, as is also described by the axle of the carriage in its motion round the axle of the machinery." We hope by next week to be enabled to give all the details of the machinery, and shall then explain, more particularly, this improved method of suspension.

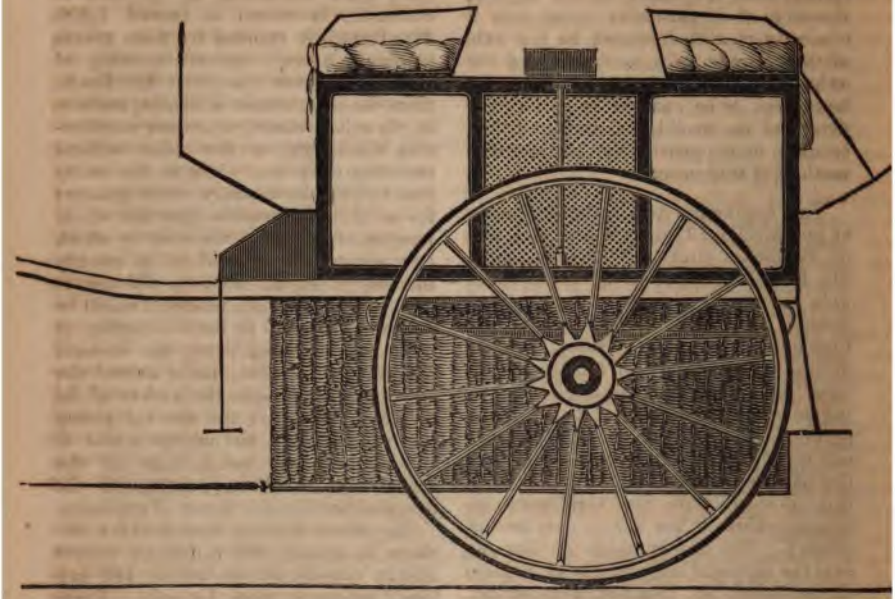
The engine has two cylinders (made of gun metal), 12 inches in diameter, and of 12 inches stroke. Time was, when Mr. Russell thought *one* cylinder preferable to two, inasmuch as it was "*impossible* that two cylinders could act together with perfect precision;" (see the article in the "Foreign Quarterly Review" before quoted;) but since attempting to reduce his theoretical notions to practice, he seems to have satisfied himself that they were extremely erroneous; (let us hope that he has also learnt from this, to speak with less confidence in future, where he has theory only for his guide). The way in which he has got over the supposed impossibility of making the cylinders act together, with perfect precision, is simple enough. The cylinders have separate crank axles, which are connected with the main axle by toothed wheels and pinions; and the unity of action obtained by this means is such, as to leave nothing to desire.

The boiler is on the excellent plan of those invented by Mr. Booth for the Liverpool and Manchester Railway steam-carriages, with the addition of Mr. Russell's patent improvements. Mr. Russell describes these to consist, 1st, in constructing the boiler in such as manner that it shall every where consist of opposite and parallel surfaces, or as nearly so as circumstances will permit, and connecting these surfaces together by means of wires or rods, placed at distances proportioned to their direct cohesive strength, and to the degree of pressure to be resisted; and, 2d, in being thus enabled to employ metal much thinner, and, consequently, more efficient (as regards the transmission of the heat), than has been ever hitherto done. The copper of the boiler of the carriage represented in our engraving is only one-tenth of an inch thick (in *Mr. Booth's boilers, half-inch* copper is used), and the number of connecting-rods, each one-fourth of an inch in diameter, is stated to exceed 1,300. Mr. Russell is enabled by these means to obtain a much greater quantity of steam in a given time than Mr. Booth, from the same extent of heating surface, or, in other words, to reduce considerably the weight of the boiler without reducing its power. Nor is the safety less, but, on the contrary, much greater; for as it is impossible that the whole number of rods, and the nuts by which they are secured, should be of exactly the same strength, and some will always be much weaker than others (it might be desirable, in fact, to make a portion of them weaker on purpose), the moment that the pressure begins to exceed the calculated maximum, the weakest of the rods will give way; and one rod giving way will instantly let out the whole of the water in the boiler, take off the pressure of the steam, extinguish the fire, and prevent all chance of explosion.

The tender is hung, as well as the carriage, on springs, and contains a copper cistern capable of containing 180 gallons, besides a place for coke. There are two tubes of caoutchouc, by which water from the cistern is conveyed to the boiler as wanted; and two brass pumps adjoining the boiler, each of which is provided with double-spherical, sucking, and discharging valves. At different stations on the road, there are spare tenders kept in readiness, with a full supply of fuel and water; so that as one tender becomes exhausted, all that is necessary is to disconnect it, and attach another in its place; a process which occupies much less time than the changing of horses in the case of the ordinary stage-coaches.

The persons necessary to the management of the vehicle are, a steersman, engineer, and fireman. The steersman occupies, of course, the box-seat. The engineer sits on the back outside seat, immediately above the engines; and has not only the throttle-valve entirely under his command, but several cocks within his reach, by which he can at all times tell exactly the state both of the water and of the steam. The fireman stands on a foot-board in front of the fire-place; and acts also occasionally as cad or gentleman-usher to the establishment.

Fig. 2.



PURIFICATION OF SALT-WATER—REPLY OF MR. FRASER TO MR. WELLS.

Sir,—I have to apologise to yourself and correspondents for not earlier replying to the letter of Mr. Wells, but I did not see it until Friday last, the 6th instant. After the perusal of his statements, I called on Mr. Fraser, to ascertain whether I really was correct in my assertions regarding him, and that gentleman has transmitted to me the enclosed letter, directing me to forward it to you, with a request that it may be inserted in your useful Journal.

I am, Sir,
Your obedient servant,
E. WHITELY BAKER.

Dover-road, Feb. 9, 1835.

Sir,—One of the greatest errors of my life has been a dislike of corresponding with the public press, which I am well convinced can alone place truth and fallacy in their relative positions. The same reluctance still prevails, and would prevent me from troubling you, did I *not think it absolutely* necessary to notice the letter signed J. Wells in your Magazine of the 24th January, relative to his alleged discovery of making salt-water fresh, &c.

I have still a more powerful reason, Mr. Editor, for soliciting the insertion of this letter in your valuable work; namely, that it may serve as a reply to your own note, attached to Mr. Baker's paper, in the Mech. Mag. of the 10th January, 1835, which I deem of infinitely more importance than the trivial statements of Mr. Wells.

Mr. Wells says that he had three interviews with Mr. Fraser, and never received any information relative to Mr. Fraser's apparatus. But did Mr. Wells during these interviews never receive any information of a nature calculated to enable him to reduce his own to practice? His ship's-hearth, according to the drawings he left with me, and which are now in my possession, ready to be shown to any person who may take an interest in the subject, is one that could never possibly answer.

Captain Gibbs, who introduced me to Mr. Wells by letter, said expressly, that

it was in the hope that my knowledge "would perfect Mr. Wells's plan." When, at the request of Mr. Wells, I afterwards went to Bromley, and saw his hearth in action, with a forest of pipes attached to it, I stated freely my objections to it; pointed out the superfluous parts that ought to be taken away, and the improvements requisite to be introduced. Mr. Wells and his partner then expressed a wish that I would construct an apparatus for them according to my views; but the order being given in rather a vague way, and limited to one apparatus only, which they might afterwards have made use of as a model to copy from, I wrote to them, mentioning terms. As I expected, however, they declined my proposals, giving as their pretended reason—that they had applied to me "simply to ascertain whether I considered their patent capable of being applied beneficially to my hearths."

The whole question now is—how was Mr. Wells's hearth constructed when I saw it at Bromley; and how was it constructed after he had had the benefit of my suggestions? I affirm, without fear of contradiction, that Mr. Wells's plan consisted at first merely in passing the condensing-pipe through an opening in and down the bow of a ship, whereas my plan was to refill the boilers by heated water from the condenser—evidently the better and more expeditious method. I am ready to meet Mr. Wells, with the permission of the Lords of the Admiralty, and prove to him that I made a machine, fourteen years ago, for converting sea water into water of the purest description, and for cooking also, at the same time, infinitely superior to any thing Mr. Wells can produce—unless, indeed, he has adopted my plans. My hearths have been fitted on board his Majesty's ship Chanticleer, and subjoined is the account given in the Voyage of that vessel of the manner of their performance.*

With respect to Mr. Wells's "own discovery," in rendering water palateable—no "gas" can assist him. All that can be done in that respect is by filtration, thereby dividing the particles of water so minutely as to allow the air which has been separated in distillation to return. It is the want of this air alone which produces the insipidity; and it is the empyreuma—occasioned by carrying the process of distillation so far as to allow the salt to adhere to the bottom of the heated coppers—that causes the bitterness. A process of filtration was exhibited by me five years ago, before Sir Michael Seymour, the Lady Mayoress of London, and a great number of persons of distinction, on board the Royal George, and the water produced was limpid, clear, and tasteless, without any of the "carbonic acid gas," mentioned by Mr. Wells, entering into the composition.

In the editorial note, appended to Mr. Baker's communication, you quote from Taylor's translation of the Commentary of Olimpodorus on Aristotle, "that seawater of itself, when unmingled with a fuliginous exhalation, is sweet." I can conceive no such thing, however, unless salt mixed with the carbonates of lime and magnesia is sweet. That the Greek sailors did procure fresh-water from salt-water by means of sponges, as you mention, I readily allow; but it must have been a tedious and dirty process, only resorted to in cases of extremity. Salt-water has also been distilled in modern times by means of stills—which would only work for a short time—and by ships' coppers which could not work while the culinary operations were going on, and being greasy, communicated to the water a tainted taste and smell. To obviate all these objections a very enlarged boiler, of peculiar make, was constructed, with sufficient power of flues to boil rapidly with little fuel, and which not only supplied ample steam for condensation, but boiled all the separate vessels without the assistance of a separate fire; affording plenty of heated

* "Another acquisition deserves to be mentioned, as it proved of the utmost utility in preserving the health of the crew in the cold and boisterous regions of South Shetland. This consists of Fraser's hearth; an article which has undergone a three years' trial on board the Chanticleer, *and its good qualities* have been the constant *admiration of every one on board.* The provisions *were cooked by it in bad weather, and in a boisterous sea, equally as well as if* the vessel had been *in harbour; and although* the hatches might be battened down, no inconvenience whatever was experienced from it; an advantage which can only be fully appreciated by those who are accustomed to small vessels. The consumption of coals, which served the culinary purposes of the whole crew for one day amounted only to one bushel. On the whole, Fraser's stove may be considered as a most valuable acquisition to a ship."

water from the condenser, to refill the boilers almost instanter, so that the procuration of fresh-water continued all day with no more fuel than was used by the old apparatus. Nor was this all; for ovens to bake, and plates to stew, which never existed before, were called into action, so that the culinary processes might be carried on even in a storm.

Notwithstanding all this, Mr. I shall presume that there is much room for improvement, and I hope shortly to show you further improvements in boilers to effect more than has ever yet been done. Although, probably, no patent can be taken out for making salt-water fresh by distilling, yet there may be a combination to effect that and other purposes more completely than at present, which would be a legitimate subject for a patent. I may illustrate this by a case in point:—A semicircular cheek was inserted in a worm, which prevented the wash from passing, and of course the spirit was pure and limpid. By this invention immense fortunes were realised. The worm *without the cheek* made it necessary to boil the still so very slowly, to prevent the wash passing over, that it took ten times longer to boil off a charge, than by the improved worm.

Apologising, Mr. Editor, for occasioning you this trouble,

I remain, Sir,

Your humble servant,

JAMES FRASER.

Feb. 9, 1835.

THE UNDULATING RAILWAY—DIFFERENTIAL CALCULUS.

Sir,—I am much obliged to the Lieut. of Engineers for the praise he has thought proper to bestow upon my lucubrations in behalf of mathematical science. I do not think, however, that it will be necessary for me, at present, to pursue the subject farther. It is not very likely that Mr. Cheverton will make many converts to his system. However, if he should think proper to deny the truth of any of my statements, let him do so, and he shall *then hear from me again.*

The Lieut. of Engineers is pursuing a *very wise course*; instead of engaging in *a war of words*, he prefers going on *steadily improving* himself in his mathematical studies; nor is he ashamed (when occasion requires) to apply for help to the contributors of your scientific journal. This is by far the best plan that he can adopt for the purpose of obtaining eminence in his professional duties. Let him try and imitate the example of an able mathematician and engineer belonging to his own corps, namely Lieut. T. Drummond.

As far as I am able, I shall endeavour to remove the difficulties which the Lieut. of Engineers complains of (No. 595).

First, it is clearly shown (Art. 5, Millar's Differential Calculus) that

$$u+d_y u\ \mathrm{K}+\&c.=u+d_y u\,(d_x y\, h+\&c.)$$

Now the Lieut. will observe that $d_x u$ is the coefficient of h in the above expansion of the new value of u, not from any thing that is shown in Art. 5, but from the notation laid down in Art. 3. Also, $d_y u\ d_x y$ is the coefficient of h, derived from the expansion of the new value of u, and the hypothetical conditions premised in Art. 5. Hence,

$$d_x u = d_y u\ d_x y$$

Again, by supposition (Art. 5), $f(x)=y$ and $f(y)=u$, from which it follows, that $\frac{u}{f}=f(x)$, and when $u=x$ $\therefore f=1$; hence $x+h=x+d_x x\, h$, or $d_x x\, h=h$ $\therefore$ $d_x x=1=d_x u=d_y u\, d_x y=d_y x\, d_x y$.

I am, Sir,

Yours, with respect,

LEWIS FREND.

St. John's Wood, Feb. 14, 1835.

P. S.—I conceive that if the Lieut. of Engineers will reconsider what he has said about the principles laid down by Kinclaven and Mr. Whitehead, in their respective solutions of the undulating railway question, he will find that, although differently enunciated, they are fundamentally the same.

THE RAILWAY DIVIDEND QUESTION—A CONVERT.

Sir,—I have read with much attention and interest your discussion with Mr. Cort on the payment of dividends by the Manchester and Liverpool Railway Company. As I also have written on that subject, I hold it due to myself (not presuming that any one else will care for my opinions), to state that, in

id, you have clearly made out
Company do pay a fair and
e dividend, *besides the interest of*
ney borrowed, which is all that
reholders can possibly require.
the Manchester and Liverpool
be unique, at present, in the
world, as to its capabilities of
What will be the result to the
other 40,000*l.* a-mile railroads
erent question.

ave the honour to be, Sir,

Your obedient servant,

FRANCIS MACERONE.

, Feb. 17, 1835.

vell—honourable too to the candour of
facerone; but with respect to "the dif-
estion," which he thinks remains to be
e must take leave to say that it is just no
at all. There are no "other 40,000*l.*
ilroads," either executed or projected in
itain—unless, indeed, we may except
r railway between Liverpool and Man-
hich has been contemplated, but for the
iven in our last and the preceding Num-
not likely to be ever undertaken. The
are the prices per mile—actual and
—of most of the "other" principal
—ED. M. M.

	PER MILE. £.	
and Birmingham ray	20,000	Contracts.
unction, between ingham & Liver-	16,000	Contracts.
npton	13 000	Estimate.
Union	16,500	Part Contracts.
Branch	12,500	Executed.
en's	12,000	Executed.
and Kingstown..	35,000	Executed.
Western	23,000	Estimate.

CHILDREN CHIMNEY-SWEEPING ABOMINATION.

-Never was any Act of Parlia-
much misapprehended and mis-
ited as that for the regulation of
y sweepers—never were the mo-
ad conduct of the promoters of
asure less duly appreciated than
the individuals who brought that
f legislation to maturity.

postscript to the letter of Junius
us, inserted in your last Number,
ntleman says:—"In the *Morning*
cle I saw a statement, that all
constructing or altering a chim-
that it cannot be swept with a
e, are liable to 100*l.* penalty."
adopting this statement, without
g to the act itself, Junius pro-
—"*This clause* would have been
to extinguish the misery of
climbing boys, by the agency of in-
formers; but our sapient legislators, with
their accustomed regard to lawyers' in-
terests, have virtually defeated the object
by letting in a flood of litigation. Who's
to define the kind of chimneys which can
or cannot be swept by a machine? A
judge and twelve jurymen, and four bar-
risters, and a host of witnesses, false-
swearers and all."

The object of the act was undoubtedly,
in this respect, to insure the construction
of chimneys so that they might be swept
by machinery; but not in the foolish
manner Junius infers from the statement
in the *Morning Chronicle.* The provi-
sions of the act, on the point before us,
are, that all withs or partitions between
any chimney or flue, which hereafter
shall be built or rebuilt, shall be of brick
or stone, and at least half a brick in
thickness; and every breast, back, and
with, or partition of any chimney or flue
hereafter to be built or rebuilt, shall be
built of sound materials, and the joints
of the work well filled in with good mor-
tar or cement, and rendered or stuccoed
within; and every chimney or flue here-
after to be built or rebuilt in any wall,
or of greater length than four feet out of
any wall, not being a circular chimney
or flue of twelve inches in diameter,
shall be in every section of the same not
less than fourteen inches by nine inches;
and no chimney or flue shall be constructed
with any angle therein which shall be
less obtuse than an angle of one hundred
and twenty degrees; and every salient
or projecting angle in any chimney or
flue shall be rounded off four inches at
the least. Penalty upon the master
builder or other master workman, One
Hundred Pounds with costs, to be reco-
vered by any person who may sue for
the same in either of his Majesty's Courts
of Record at Westminster. But this clause
is not to prevent the construction of chim-
neys or flues at angles with each other of
ninety degrees or more, provided they
have proper doors or openings not less
than six inches square.

I hope Junius Redivivus will now be
of opinion that this clause is "sufficient
to extinguish the misery of climbing
boys, by the agency of informers," sooner
or later, aided by a humane and intelli-
gent public; and that "our sapient le-
gislators" have not "defeated the object."

The paragraph in the *Morning Chronicle* was, I presume, to put builders on their guard; and in so doing stated the effect to be produced without detailing the means, as, on reference, I find was done by myself in one of those letters in your periodical, which Junius did me the favour to sanction.

I am, Sir,

Your obedient servant,

ARCHIBALD ROSSER.

15, New Boswell-court, Lincoln's-inn,
Feb. 14, 1835.

CONDENSATION OF THE STEAM OF STEAM-ENGINES BY EXTERNAL APPLICATION — MR. HALL'S AND MESSRS. BUSK, KEENE, AND CO.'s PROCESSES.

Sir,—We are sorry to observe, from your Number of the 7th inst., that Mr. Archibald Rosser, and, through him, his friend Mr. Hall, of Basford, are still disposed to maintain the latter gentleman's claim of originality as to the invention and practice of the mode of condensing steam-engine steam by external application, notwithstanding what has been recently advanced, both by Messrs. Braithwaite and other parties, tending to show the total fallacy of such claim.

We believe that we were ourselves the original contrivers, or, at least, the arrangers for practice, of that improvement. It is, we have long been satisfied, one of very great importance, and one which is likely to effect more towards widely extending the power and utility of steam-navigation than any other which has been devised, since such navigation commenced, unless it may be with the single exception of the introduction of light high-pressure engines, with tubular boilers, instead of the cumbrous condensing engines, with their usual enormous boilers, containing at least five times the quantity and weight of water which is required for the improved boilers. Whilst making this exception, we would observe that, although the plan of condensation by external application may be well applied both to high and low pressure engines, we hold it more peculiarly beneficial and important in the case of high *pressure.*

We have long practised this improve*ment, just in the* mode in which we understand that Mr. Hall now practises it; viz., by passing the steam, as it comes out from the working cylinder, through an enclosed nest of small copper tubes, and passing a stream of cold water through such nest of tubes, so as to bring such water in contact with the exterior of all the copper tubes. This cold water carries off the heat of the steam, abstracting it through the substance of the tubes, and thus causes the steam, from being deprived of its heat, to return to the state of water, when it is collected in a reservoir below the tubes. It is now pure, or distilled, water, and, as such, free from all, or very nearly all, salts, or other matters, which have a tendency to corrode or incrust the interior of boilers. As it is collected, it is constantly returned into the boiler, to be again and again raised into steam, and follow the same course as before. The boiler requiring no other, or scarcely any other, supply of water, than sufficient to make good any deficiency occasioned by trifling leakage, receives nothing, or very little matter, calculated to injure it, and may thence be preserved clean, and in a sound state, for a very great length of time, and very many times longer than when the said plan is not adopted. Some of our boilers so guarded, have been constantly in work for upwards of three years, without ever requiring cleaning. The benefit of this for long voyages is almost beyond calculation.

We first fitted up a boat on this plan in the year 1828. We have since, both here and in France, fitted several others upon the like plan. We have, in all instances, found it highly beneficial, and we constantly use and recommend it, on all occasions which offer. Under these circumstances, we cannot conceive that Mr. Hall is entitled to any credit for either originating, or even improving, the invention in question. It is true, we understand, that he has thought fit to take out two patents upon the subject, and to make the usual oaths needful in that behalf; the one patent being dated in Dec. 1831, and the other in Spring 1830; but can either of them be of the least avail, since our continued practice, which has always been public and a matter of business, is of much older date than the date of either of the said patents?

In the month of Oct. 1831, in particular, our own small steam-boat, the Queen

de, equipped according to the said
as submitted to the inspection of
he Admiralty and Navy Boards,
ported on by the officers of Wool-
ard. Would not this alone suffice
olish both patents, in every Court
tminster-hall?

will conclude by observing, that
cute orders for the application of
inciple, either with our own en-
or those of others, free of any
for patent right.

We are, &c.

BUSK, KEENE, & Co.

skside, Southwark,
eb. 16, 1835.

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srs. Busk, Keene, and Co. (as well
ers, perhaps,) labour under a consi-
e misapprehension as to the nature
xtent of Mr. Hall's patent claims.
w what they actually are, we shall
n those parts of his last specification,
ich these claims are defined. Mr.
it will be found, confines his inven-
"steam-engines worked by vacuum
ed by condensation;" whereas
s. Busk, Keene, and Co., state that
rocess "may be well applied *both*
and high pressure engines," and
latter with more advantage than
e former. Neither does Mr. Hall
im to the invention of the mode of
using by external application; on
ntrary, he expressly disclaims it.
e says, that he has combined the
d of condensation by external ap-
on with certain other processes
nd all of them, likewise, disclaimed
ginal), in such a *manner* as to cause
ethod to succeed perfectly (mean-
f course, in the case of condensing
es), while "all persons who have
former attempts of the same nature
failed." The *manner*, again, does not
l either the form or arrangement
e parts and processes combined
ter, so much as the *proportions*
they ought to bear to each other.
re not here called upon to offer any
n as to the *patent* worth of this
ination of Mr. Hall's; but we think
st be allowed, that there is at least
practical worth in the rules which
ecification furnishes, for the pro-
ns to be observed in the application
condensing-by-external-application
process to vacuum engines. It is, on the other hand, equally due to Messrs. Busk, Keene, and Co., to say, that the plan followed by them has the advantage over that of Mr. Hall's of great simplicity; and that though it may not carry the process of recondensation to the degree of perfection which Mr. Hall's condensation is said to do, it carries it quite far enough, to induce many to seek no further.

Mr. Hall's Specification.

"The objects of my invention (which invention I confine to steam-engines worked by a vacuum produced by condensation) are to condense without injection water (for the purpose of creating as good a vacuum as is obtained and well known in injection-engines), the steam which passes through the engine for the working thereof, and also to condense for the most part (if not wholly) that portion of steam which usually escapes into the atmosphere through the safety-valves, when the pressure of the steam in the boiler is too high during the working of the engine, in order that the water resulting from the condensation of such steam may be returned into the boiler. And also, further, to supply so much more distilled water to the boilers of the above mentioned description of engines, as is required to supply and replace any waste that may take place in the working thereof, in order to avoid the introduction of any water (into the boilers) containing saline or other extraneous matters.

"My invention does not consist in the novelty of any one of the five apparatus hereinafter mentioned, but in the combination of the whole five, or at least three out of the five, within proper proportions (as hereinafter described) as regards the first three, which I have found, by experience, to be beneficial; and from the want of knowing and observing which, I have reason to believe that all persons who have made former attempts of the same nature have failed. I now proceed to describe the above mentioned five apparatus, consisting of—

"First, a sufficient quantity of metallic surfaces in the form of vessels, channels, passages, or pipes, of any convenient form, arrangement, or construction, wholly open to and being pervaded by steam on its exit from the steam cylinder of the engine, the water resulting from the condensation thereof coming in contact with the metallic surfaces, and making its immediate escape without being detained in the pipes, as was effected by my invention, for which I obtained a patent, dated December 22, 1831. The extent of such metallic surfaces should

be about 2,800 square inches for the condensation of each 60,000 cubic inches of steam per minute, when it is of the pressure of 4 lbs. upon the square inch, above the pressure of the atmosphere. I use fifty thin copper pipes, half an inch internal diameter and 3 feet long each, for the condensation of the above mentioned quantity of steam at the aforesaid pressure, which quantity of steam per minute I consider as productive of 1-horse power.

"Secondly, a pump, or any other proper apparatus for the passing of a sufficient quantity of cold water amongst such above mentioned pipes, not only to condense all the steam of steam-engines, but also to cool the water resulting from the condensation thereof to as low a temperature as (or even lower than) that of the mixture of the condensed steam and injection-water, which is discharged from the air-pumps of injection-engines in order to produce, by such application of cold water, when used in combination with the metallic surfaces, as above stated, and with the air-pump hereinafter mentioned, as good a vacuum as is obtained and well known in such injection-engines, if not indeed a still more perfect vacuum. The quantity of cold water which I employ is 10 gallons for such condensation of such 60,000 cubic inches per minute.

"Thirdly, the ordinary air-pump, of the capacity hereafter stated to produce, when in connexion with the before mentioned two apparatus, a sufficiently perfect vacuum, as above defined, by carrying away not only the water resulting from the condensation of the steam, and any air that may enter into the condenser through bad joints or otherwise, but also the vapour arising from the water resulting from the condensation of the steam, such vapour being more or less dense, according as the water is of a more or less elevated temperature, as is shown by the experiments and tables of Mr. Dalton, and other scientific men. Such air-pump, if a single acting pump, should be of such a diameter that its area shall not be less than one-eighth of the area of the steam-cylinder, the piston making (as is usual in most engines) a stroke half the length of that of the piston of the steam-cylinder, and both pistons making the same number of strokes per minute; the above capacity I state as the minimum at which the pump should be applied, but the capacity may with advantage be considerably increased: I use it of half of the area of the steam-cylinder, under the above mentioned circumstances, and it may be increased even beyond that *capacity*.

"*Fourthly*, an apparatus for distilling *water to replace* the waste of water that may take place in the working of the engine, in order to avoid, as above mentioned, the introduction of any water into the boilers containing saline or other extraneous matters.

"Fifthly, an apparatus (which I call the steam-saver) for saving the steam that usually escapes into the atmosphere from the safety-valves when it becomes of too high pressure during the working of the engine, the apparatus causing such steam to pass into the condenser to be converted into water and returned to the boiler. It may be proper here to remark, that within certain limits, which experience will readily suggest, the above mentioned proportions of metallic surfaces of cold water and capacity of the air-pump may be varied in a certain inverse order, that is to say, if the cold water be diminished, the extent of metallic surfaces, or the capacity of the air-pump, or both, should be increased. And, on the other hand, if the extent of metallic surfaces be diminished, the quantity of cold water, or the capacity of the air-pump, or both, should be increased to produce the same effect.

* * * * *

"Having now described the five several apparatus, the combination of which (within proper proportions, as hereinbefore described, as regards the first three) constitute my invention, I proceed again to define and explain the extent of my claims; I now therefore state, that I do not claim the exclusive use of any one of the five apparatus herein described, taken separately, some of them, if not all, having been used before; nor, indeed, do I claim the exclusive use of any two of them, if unaccompanied by any or either of the others: but I do claim as my invention the exclusive use of the three-fold combination of the sufficient quantity of metallic surfaces, the sufficient quantity of cold water passing among them, and the sufficiently capacious air-pump, as hereinbefore fully described, whether the said three-fold combination be used alone or combined with the distilling apparatus and steam-saver, or either of them: I also claim the exclusive right of combining the distilling apparatus and the steam-saving apparatus, or either of them, with the above mentioned three-fold combination, or even with the two first of them, viz. the metallic surfaces and cold water passing among them, should a less air-pump be used."

TESTS FOR ARSENIC.

Sir,—As arsenic is a poison so fatal in its effects, and unhappily so frequently employed with criminal intentions, its

on becomes a matter of the great-portance. A short letter contain-e method of applying the most ap-tests, may therefore be not unac-le to your readers.

only apparatus required is a wine and a small glass tube. The tests commonly and successfully em-are three:—1. Ammoniaco-nitrate r; 2. Ammoniaco-sulphate of cop-3, Hydrosulphuric acid, or sul-ted hydrogen.

first is easily prepared, by dissolv-ar caustic (nitrate of silver) in six times its weight of distilled ; when ammonia is added to this n, a brown precipitate will fall which is again to be dissolved by ss of ammonia; the liquid is now for use. When a small quantity d to a fluid containing arsenic, a position takes place, nitrate of ia is produced, which remains in o, and a yellow insoluble arsenite r falls to the bottom. There is, r, an objection to this test: the ce of muriate of soda (common which is very likely to be met the stomach, determines the pro-of chloride of silver, which is the yellow arsenite in this case t either appear at all, or, if it does, our is materially changed.

ammoniaco-sulphate of copper, d in a similar manner to the ., by adding an excess of am-to sulphate of copper, is free from jection; when this salt is poured luid containing arsenic, a beauti-n precipitate, known as a pig-y the name of Scheele's green, ceed. Dr. Christison has, how-hown that this test must not be ly relied on; for he has found hen ammoniaco-sulphate of cop-poured into a fluid holding in so-certain animal or vegetable sub-, but no arsenic, a greenish pre-, which may be mistaken for 's green, is produced, while in porter it occasions none at all, if enic is present only in a small y. This I have satisfied myself several experiments; and would re advise, when the quantity to be d on is small, that the test next *entioned be applied immediately, certain, and by so doing,* we shall evidently have a larger quantity to operate upon.

Take a small retort, and put into it some powdered sulphuret of iron, or, what is still better, sulphuret of antimony (the crude antimony of the shops); pour on the powder a little diluted sulphuric or muriatic acid when sulphuretted hydrogen gas will immediately be evolved; put the end of the retort to the bottom of the suspected liquor, when a yellow precipitate will fall down: but the experiment must not stop here, for cadmium, selenium, tin, and antimony, all afford a yellow precipitate with sulphuretted hydrogen. Throw the liquor on a filter of blotting-paper, and after having washed the yellow powder which remains behind, dry it, and put it in a small glass tube, with a pinch of black flux—easily made, by throwing into a red-hot crucible argol (bi-tartrate of potassa) with rather less than half its weight of nitre—if the yellow powder is sulphuret of arsenic, the heat of a common candle will reduce it, and the upper end of the tube will become lined with crystals of a strong metallic lustre. But still further proof may be obtained; for, by heating that part of the tube containing the metal, it will be again brought to the state of arsenious acid, commonly known as the white oxide.

These manipulations are simple, and easily acquired; and when it is considered how very important the detection of the poison is, nobody will, I conceive, think it waste of time to practise the operation till they can do it with satisfaction and facility. A small fraction of a grain of arsenic may by the last test be made evident.

I am, Sir,

Your obedient servant,

G.

Bath, Feb. 6, 1835.

IMPROVEMENT IN FIRE-TONGS.

Sir,—To *prevent* pieces of coal slipping and falling from the tongs, in carrying them from the scuttle to the fireplace (which is often the case), and by which hearth-rugs and carpets are injured and soiled, I have rivetted four small sharp spikes, of *well-tempered steel*, into each lip of the tongs, projecting about ¼ of an inch, which completely

answers the purpose. The utility I have experienced in this trifling invention, induces me to send it for insertion (if you think proper) in your useful and excellent Magazine, that others may reap advantages from it as well as myself.

I am, Sir,

Your obedient servant,

J. BULLEN,
Rear-Admiral.

Bath, Feb. 17, 1835.

COLONEL BEAUFOY'S WORKS.*

MARK BEAUFOY is a name, we fear, but little known to the generality of readers —not much, perhaps, even to the philosophic few; and yet is it the name of one who did more for science—cultivated it more ardently—made larger sacrifices, both of wealth and ease, for its sake—and laboured to far better purpose than any other ten men of his time. That he should have lived and died, so untrumpeted by fame, can surprise no one, however, who looks to the quiet and silent nature of those particular labours which constitute his title to the remembrance of posterity. Col. Beaufoy's love of science and its utilities, was of a kind neither to be inspired nor influenced by the applause of the passing hour. To pursue, with unflinching steadiness, through a period of more than forty years, a course of laborious and expensive investigation into so complex and difficult a branch of physics as that of the resistance of fluids—to make trial of one form of body, and one order of circumstances, after another, till almost every possible variety of form and circumstance was exhausted—to multiply experiments, and the calculations consequent on these experiments, till they amounted to thousands and hundreds of thousands;—to beat all this trouble, and at all this expense, for the sake of establishing a few truths, important to navigation and interesting to philosophy—with no assistance save that of two or three devoted associates (one of them, memorable to relate, of the gentler sex), and under every possible discouragement from national indifference, and the neglect even of that scientific world, of which he was an ornament*—is such an instance of abstract devotedness to a great public and philosophical purpose, as could only have been furnished by one who laboured "for all time," and was well content to leave his "Works" to speak for him to after ages.

Col. Beaufoy appears to have commenced at a very early age that particular course of experimental investigation which formed the favourite occupation of his life. He was not fifteen, when his

"attention was first drawn to the subject in consequence of his hearing (it) stated, one evening, as an axiom generally received by naval mechanics, that 'a *cone drawn through the water with its base foremost experienced less resistance from the fluid than with its apex foremost.*' This paradoxical assertion excited young Beaufoy's curiosity, and, before bed-time, with the assistance of a neighbouring turner, he ascertained the fallacy of the alleged opinion, by making the experiment in one of the coolers of his father's brewhouse, the large bunch of counting-house keys being put in requisition for a motive power. The impetus was thus given. This experiment was the precursor to many others, in the course of which he ascertained that the method of determining the resistance by drawing the bodies in a horizontal direction, with a weight over a small pulley, and then measuring the space moved over with a watch, was ill-adapted for experiments upon a small scale, owing to the impossibility of telling when the uniform motion of the body passing through the water commences. Baffled in this first attempt, and having frequently observed on what uncertain grounds shipwrights, in general, have founded their different and variable rules for the construction of vessels, he was desirous of making a set of experiments that might, if possible, reduce their art to fixed and determined principles."

* *Nautical and Hydraulic Experiments, with numerous Scientific Miscellanies. By Col. Mark Beaufoy, F.R.S.* Vol. i. royal 4to. Private Press *of Henry Beaufoy, F.R.S.*

* We may refer, for a striking instance of this neglect, to the Historical Sketch, by Professor Leslie, of the Progress of the Mathematical and Physical Sciences, prefixed to the last edition of the Encyclopædia Britannica. Sir John mentions, with due respect, the investigations of Bossut, D'Alembert, and other foreign philosophers, into the resistance of fluids, but takes no notice whatever of those of his countryman Beaufoy—though quite as worthy of being recorded. The probability is, that the latter had not come to the Professor's knowledge—for Leslie, though hasty, and somewhat superciliously inclined, was thoroughly upright and honourable.

Beaufoy made with this view two
e sets of experiments; the first
"Experiments to ascertain the
itive resistance which different
onstructed on the same base and
icular, meet with in moving
a fluid;" the second, "Experi-
to determine what form must be
a solid to enable it to move
water with the smallest resist-
Both sets of experiments were
attaching the different solids to
ılum fixed over the centre of a
of water, and immersed in it to a
epth; those solids with which the
in described the largest arcs
resumed to be those which expe-
the smallest resistance. To this
f experimenting it has been ob-
and with good reason, that the
ce which a body experiences
cribing a circular arc, does
necessity indicate the resistance
it will meet with in following a
line Colonel Beaufoy seems
been aware of the force of this
n, for he is said to have "held
f his pendulum experiments in
imation." We apprehend, how-
iat this observation of the editor
Works" must be taken with con-
le deductions; for it will be seen,
e following remarks of Col. B.
, that he held the experiments in
a to have established several
of very great importance to nauti-
nce; and the truth is, that though
of motion described in the pen-
experiments was not exactly the
s that described by a ship at sea,
sufficiently analogous, to furnish
esults that have not been mate-
isturbed, by any of the better con-
xperiments subsequently made:—

om a view of these tables, it will be
hat the result of many of the experi-
contradicts the prevailing theory of
rchitects, and cannot, perhaps, be
xplained on any known hypothesis.
rcumstance has led the writer to re-
s experiments again and again, but
the result confirmed, he thought it
y to record them.

long the conclusions suggested by the
one of the most curious is, that the
ing the length of a solid, of almost
m, by the addition of a cylinder in
ddle, exceedingly diminishes the re-
with *which it moves,* provided the
of water continues to be the same—
a fact, I apprehend, that cannot be easily explained.

"A second conclusion from the tables is, that, contrary to the received opinion, a cone will move through the water with less resistance with its apex foremost than with its base,

"A third and more important conclusion resulting from the tables is, that the greatest breadth of the moving body should be placed at the distance of two-fifths from the bow.

"There are figures, indeed, that are exceptions to this rule, for in the double parabolic the greatest breadth should be given to the middle, and in the double cone it should be placed still farther back; but as floating solids of these forms have no reference to use, the exceptions they constitute have no effect on the general rule when applied to naval architecture.

"The common opinion that the greatest breadth of a ship should be given to the middle in preference to any other part nearer the bow, seems to have arisen from a desire of diminishing the angle of incidence. But though the advantage of that diminution is undoubtedly great, yet it is more than balanced by the disadvantage of the increase it occasions to the surface.

"From an attentive consideration of these two circumstances, it would not perhaps be difficult to ascertain by calculation the point at which the greatest breadth of a vessel should be placed. Be this, however, as it may, the experiments clearly prove that the ship will move through the water with the least resistance when her greatest breadth is distant from the bow two-fifths of her whole length.

"A fourth conclusion suggested by the tables is, that the bottom of a floating solid should be made triangular, as in that case it will meet with the least resistance when moving in the direction of its longest axis, and with the greatest resistance when moving with its broadside foremost.

"Such are the most important of the many conclusions which the experiments recorded in the different tables have suggested to my mind.

"Mr. Emerson has published in his Mechanics a table for the construction of a solid, which in his opinion will move through the water with the smallest resistance. Of the principles of his system, as I do not find them any where explained, it is difficult to judge; but certain it is, that in practice the construction he recommends is inferior to a variety of others.

"When the conclusions suggested by the tables are considered with a view to practical improvements in the system of naval mechanics, it is necessary to attend to the effect produced by the water on the after

part of the moving body; for if the solid moves with a velocity less than that which the water presses to the opening occasioned by the motion of the solid, that excess in the velocity of the water has a tendency to diminish the velocity of the solid. But if the velocity of the solid is exactly equal to the velocity of the water which presses on behind, the motion of the back water will not be attended with the least effect; and if the velocity of the solid be greater than that which the water rushes to the opening, the resistance made to the solid will be increased by the weight of water resting upon it in consequence of the vacuum."

Not long after the experiments to which these remarks refer had been concluded, a "Society for the Improvement of Naval Architecture" was formed, of which Colonel Beaufoy was (we believe) the founder, the present King, then Duke of Clarence, president, and "a numerous company of noblemen and gentlemen" members. One of the first measures resolved upon by this Society was "to make a series of experiments on the resistance of water, upon a much more extensive scale than any which had yet been made in this or any other country." The Greenland Dock was fixed upon as the largest and most convenient piece of still water for the purpose near London, and the upper end was chosen, as the least liable to the chance of disturbance from the general business of the dock; there being at that part a clear run of 400 feet, and 11 feet depth of water. A Committee of the Society was appointed to superintend the experiments, but it appears that though they all "entertained the most ardent desire to render themselves useful in the business," yet "from their professional and other individual concerns, few of them were able to bestow more than their occasional assistance:"—

"The whole onus, therefore, of regular attendance from first to last, and of conducting the process (for he never absented himself for a single day) was borne by Colonel Beaufoy; the assistant secretary to the society, Mr. James Scott; and by Captain John Leard, as often as his nautical duties would permit him to attend."

Nor was it in active assistance merely that the members were found wanting; *for, after a* brief time, they forgot (most *unanimously* it seems) to pay their subscriptions, and, "in consequence of this event, the experiments were, for a considerable period, conducted and brought to a conclusion *solely at the expense of Col. Beaufoy.*"

While thus deserted by "the numerous company of noblemen and gentlemen," whose promises of co-operation and support had led him to embark in this extensive and costly series of experiments, Col. Beaufoy found, in the bosom of his own family, an assistant who, albeit of a sex unused to abstruse calculation, seems to have been of more service in the matter than the whole Society put together:—

"For some years the calculations were made at Colonel Beaufoy's residence at Hackney Wick by himself, assisted by his wife, who contributed no inconsiderable share to the progress and success of the experiments; for favoured alike in person and in mind, being a woman of considerable talent and scientific attainments, besides the usual female accomplishments in which she excelled, she was a good mathematician and practical astronomer, familiar with all the details of the observatory, the calculation of eclipses, &c.; and by method and strict economy of her time, while the domestic arrangements proceeded with perfect regularity, she was never at a loss for leisure in furtherance of her husband's pursuits. But,

'Pauca decet ..... rosaque tabellis
Ut bene depicta floris odorecaret.'

"She died in the year 1800, at an early age, after a few hours' illness; an irreparable loss to her husband. He survived her twenty-seven years, and proved the sincerity of his attachment to her memory by not marrying again. A few hours before he died he spoke of her with emotion, which showed that time had not caused the smallest diminution in his affection for this estimable woman."

The experiments in the Greenland Dock were made in the years 1793, 1794, 1795, 1796, 1797, and 1798, and amounted to between 9 and 10,000. The calculations to which they gave rise were, however, innumerable; nor were they completed for more than ten years subsequent to the final close of the experiments themselves. After Mrs. Beaufoy's decease, Colonel Beaufoy was assisted in these calculations by Mr. (afterwards Captain) James Scott, whose previous attendance at the experiments we have before noticed. At length (1812-13) Colonel Beaufoy had the

satisfaction of seeing a perfect copy of the whole of the experiments, with appropriate drawings of the apparatus and solids employed, comprised in two folio volumes.

On the publication of these volumes it came, for the first time, to Colonel Beaufoy's knowledge, that while he had been engaged in preparing the Greenland Dock experiments for the press, a series of experiments of a precisely similar nature was carrying on in Sweden, under the direction of some men of science of that country, who were wholly unaware of what had been previously done in England.

"The Swedish experiments were conducted under the sanction and at the expense of the Society of Iron-Masters at Stockholm, by Messrs. Lagerhjelm, Forselles, and Kallstenius, and were tried at Fahlu mine, in the years 1811, 1812, 1813, 1814, and 1815. In 1819, Assessor Lagerhjelm was so good as to send to Colonel Beaufoy six copies of the *first* volume of the Swedish experiments, which he distributed forthwith to each of the several public departments in England, to whom it might be supposed the cultivation of the noble science of naval architecture would be not less a pleasure than a duty. *But no notice was taken by any of them beyond the formal acknowledgment of the receipt of a book.* Colonel Beaufoy then made two ineffectual attempts to procure a translation of the work into English, *at his own expense*; but owing to the want of mathematical knowledge upon the part of the translators, their version was not more intelligible to an Englishman than the original language."

In 1825-6, Assessor Lagerhjelm sent over copies of the *second* volume of the Swedish experiments; but owing to the circumstances stated in the preceding extracts it remained equally a sealed book to the English reader.

In 1827, Colonel Beaufoy died, and bequeathed his manuscripts (published and unpublished) to his eldest son, who has entered on the duties of his literary executorship in a manner which sheds new lustre on the name of Beaufoy. He has not only commenced publishing a complete edition of his father's "Works"—including his Scientific Miscellanies, as well as his Nautical and Hydraulic Experiments—but, in order to "fulfil his father's wishes," in regard to the Swedish experiments, has *resolved on having a correct* translation of them made into English (*cost what it may*), to accompany the English series. He is publishing them, too, in a style of bibliographical splendour, which, though it can add nothing to their intrinsic value, is admirable for the spirit of liberality which it displays, and may not perhaps be without its use, in obtaining for them all that they now want—an adequate share of the public attention. And what is still more memorable and praiseworthy — this princely edition of his father's "Works," with the experiments of the Swedish philosophers to boot—an edition, consisting of no less than 1,500 copies—is published for gratuitous distribution *only*. "*As Colonel Beaufoy's scientific labours were given to the public gratuitously, so likewise are these volumes intended for the honour of gratuitous distribution.*" The English and Swedish experiments are stated to have cost together not less than 50,000*l.*; and of this sum we should suppose that full one-half must have come out of the pocket of Colonel Beaufoy. The first volume of his "Works," cannot, by all accounts, have cost his son much short of 5,000*l.*, and as two more volumes are announced to be forthcoming (including one entirely appropriated to the Swedish experiments), should these be equally expensive, here will be a further sum of 15,000*l.*, making nearly 40,000*l.* in all, expended out of the same family purse, for the good of science, of the country, and of the world at large!

Let us hope, for the honour of the nation, that so noble an example of public spirit will not be long suffered to live in the applause of critics alone. The Duke of Clarence, who was at the head of that Society, whose desertion entailed on Col. Beaufoy so large a portion of his pecuniary sacrifices, is now King; and his Majesty has it in his power—as we trust he has the will—to make to the living head of the family, the only sort of amends which it would be becoming in him to offer, or agreeable (so we feel well assured) to a Beaufoy to receive.

The first volume of the "Works," now before us, comprehends the two series of pendulum experiments on the resistance of water, made by Col. Beaufoy previous to 1784, and the whole of the experiments afterwards made at the Greenland Dock, with and without the patronage of

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No. 603. SATURDAY, FEBRUARY 28, 1835. Price 6*d*.

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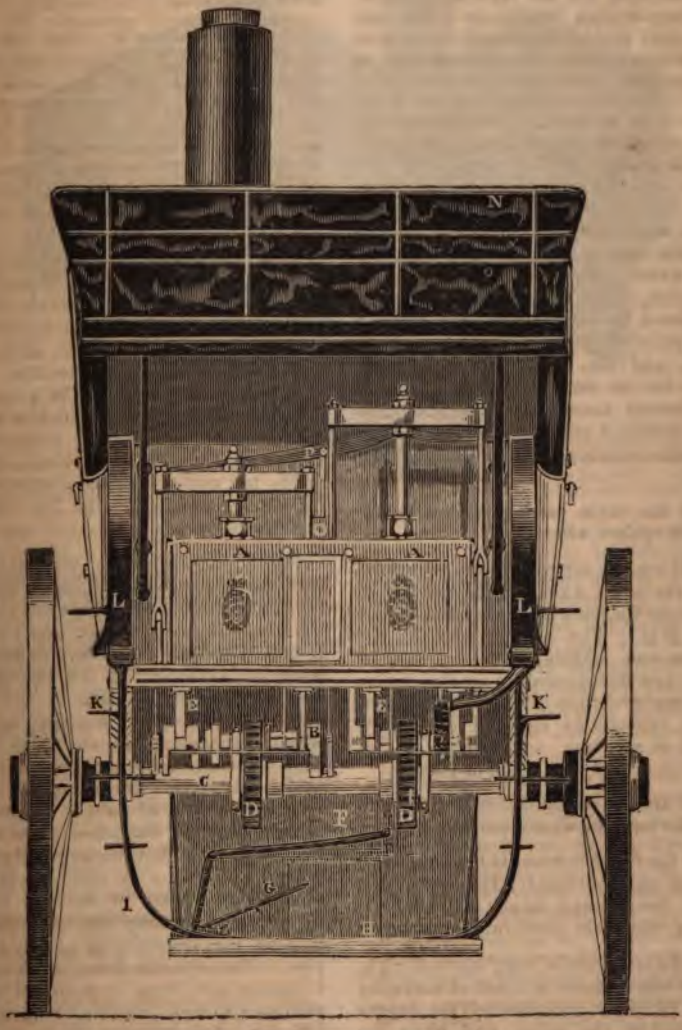


RUSSELL'S STEAM-CARRIAGE ENGINE AND BOILER.

We described, in our last number, the external appearance of Mr. Russell's steam-carriage, and also those peculiarities in its construction which seemed to us most deserving of attention. We now propose to go a little more into detail; and for this purpose we give, 1st, a transverse view of the back of the carriage, showing all the material parts of the steam-engine machinery; 2d, an isometrical projection of the boiler; and 3d, a diagram explanatory of the method of suspension.

Fig. 1. A A are the two gun-metal steam cylinders, of 12 inches diameter, and 12 inches stroke; the ends are ground into the cylinder at top and bottom; the piston-rods work through the covers, and are connected by cross-heads and side-rods to B B, the two separate crank axles. Each of the cylinders has four ports, which are alternately opened and closed by slide-valves; one pair of these ports being for the admission of the steam, and the other pair being used solely for its exit. This combination Mr. Russell claims as original. The valve motion is produced by an eccentric apparatus attached to each of the crank axles.

C is the main carriage axle, inserted into the spoked wheels.

D D are the cogged wheels connected with the main axle, which are put in motion by the pinions on the small crank axles B B. The relative size of the pinions and wheels being as 1 to 2, every two double strokes of the engine cause one revolution of the spoked wheels. These proportions may, of course, be varied at pleasure, so as either to increase or diminish the rate of motion.

E E are two sun and planet straps, to keep the toothed wheels properly in gear.

F is the furnace door; G the handle for opening and shutting it; H, platform on which the fireman stands; and I I the rods by which the platform is suspended.

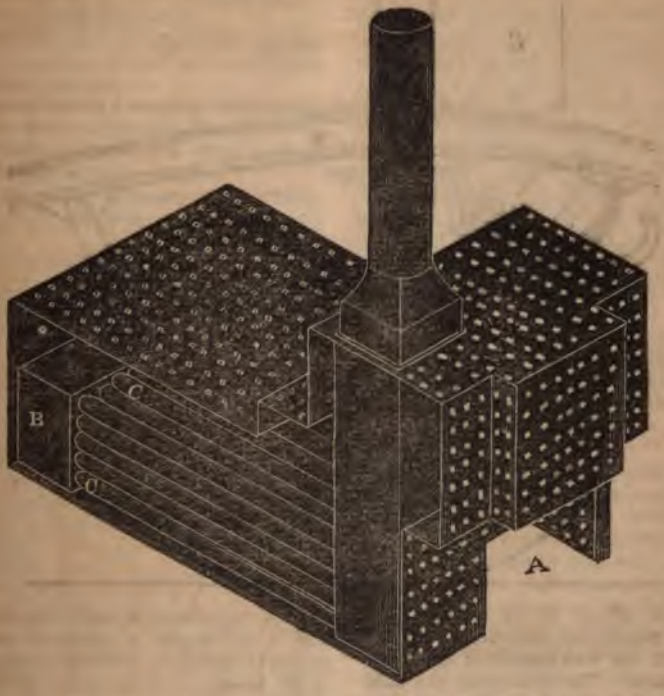
N the engineer's seat, on the right side of which there is a set of cocks, by which he can at any time tell the height *of water* in the boiler, and when the pumps are at work. There is also a lever by which he commands the throttle-valve, and can set the engine off and on as occasion requires, but this could not be shown in the drawing.

O P are the two pumps, wrought alternately by the ends of the cross-heads: each of them being furnished with two suction and two discharge valves (all spherical), to obviate every chance of accidental choking.

The combinations by which the *steering* of the carriage is effected, are necessarily excluded from the back view which we have just been describing; and are so simple that we have not thought any separate engraving requisite for their explanation. The steersman, who occupies the right hand seat on the front box (see elevation of the carriage in our last Number), turns, a vertical wheel or tiller, communicating, by an oblique universal joint motion, to a toothed segment on the fore-wheels, which it turns by a small pinion. The arrow in front follows the motion of the front wheels, and points out at once to the eye the direction which the carriage is taking. The prominent position of the steersman enables him to avoid, with the utmost promptitude, every obstacle that offers itself, and to guide his vehicle with a degree of precision not exceeded by the first whip on the road.

Fig. 2. The boiler is here exhibited with the outer covering of one of the sides removed, in order to give an insight into the internal arrangement. As we mentioned in our last Number, this boiler is, with the exception of the interior tie-rods, on the plan of those of the Manchester and Liverpool Railway carriages, which experience has shown to be the best yet constructed for locomotive purposes. A is the fire-place, containing usually 4½ feet of fuel in a state of ignition; B the back-flue; and C C C the return flues, terminating in the chimneys. The steam is collected in a reservoir or separator at the top, whence it is passed *directly* into the cylinders, without the intervention of any steam-pipe. The requisite draught through the fire-place and flues is produced by the plan now so well known and universally followed, of discharging the waste steam

Fig. 2.



into the chimney. The tie-rods, which brace together the parallel plates of the boiler, are not shown in the portion of the interior laid open in our engraving, in order that the situation of the back and return flues might be more clearly seen; but the number and direction of these rods may be gathered from the screw-nuts represented on the outer plates—a rod proceeding in a straight line from each nut to the opposite parallel plate. The number of these rods, as stated in our last, exceeds 1,300. The distances between them are such, that each has to sustain the pressure upon 9 inches superficial.

The boiler is suspended below the carriage by two elastic perches, the four extremities of which rest perpendicularly over the four under springs of the carriage.

Fig. 3. We give this separate diagram to explain the peculiar and very ingenious arrangement by which Mr. Russell *has contrived that each spring* "shall in its flexure describe, at a particular point, such a point as is also described by the carriage in its motion round the axle of the machinery." The springs (K K) on which the machinery is suspended, are formed *ogee*, that is, turned up at one end, and down at the other. When K (see diagram) is depressed, the centre of suspension S is carried backwards as well as downwards, and describes the circular arc *a b*. The small crank-axle shown at *e* is fixed (as regards position) to the point of suspension S, and therefore describes a parallel arc of a circle *c d*, which has for its centre the great axle A. The pinions on the smaller axles thus roll round a part of the circumference of the wheels upon the large axle, without inclining deeper or shallower into the gear of the teeth; whilst the point S is being thrown up or down according to the inequalities of the road. C marks the position of the cylinders, and F that of the framing.

The protection which this mode of

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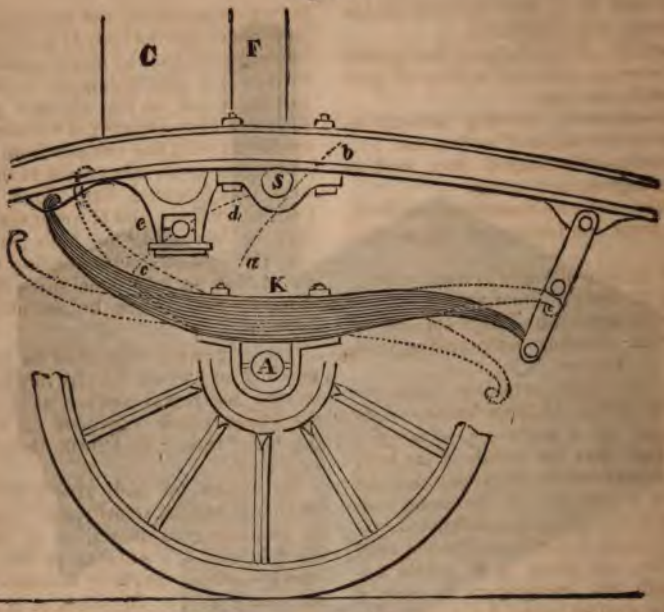

suspension affords to the working part of the machinery, constitute, in our judgment, the best feature of the entire arrangement. The liability of the bolts and pins of the engines to be started by sudden concussions is much diminished, and a uniformity of vibration is imparted to the boiler, which must be greatly in its favour, both as regards efficiency and durability.

REPORT OF ROBERT STEPHENSON, ESQ., C. E., ON THE FORMATION OF A RAILWAY BY UNDULATORY PLANES, TO THE DIRECTORS OF THE LONDON AND BIRMINGHAM RAILWAY.

Since the receipt of the memorial to the Directors, respecting the formation of railways by undulatory planes, I need scarcely say that I have been so closely occupied, that I found it impossible to reconsider, carefully, the opinions I had formed on the subject, founded upon some experiments in "The Gallery of Practical Science," with a model prepared by Mr. Badnall. These experiments were considered by several persons conclusive in favour of an undulatory surface for a line of railway.

I drew a different conclusion from them, and made some remarks and calculations at the time, which I considered fully confirmed it. Since that time, I *have read the greater* part of the *controversy, which has* been carried on in the "Mechanics' Magazine," and paid especial attention to the experiments made upon the Rainhill plane, with several of the locomotive engines belonging to the Liverpool and Manchester Railway Company, without perceiving any reasons for changing the view I originally took.

The following observations are extracted from those above alluded to, as far as appears necessary for explaining the outline of the arguments upon which I had based my views:—

A C, a horizontal plane.

A B, and B C, two inclined planes completing one undulation.

A carriage, in moving over the inclined plane, may be conceived to be acted upon by three forces; viz.

First.—Gravity, varying directly as the *sine* of the angle of inclination.

Secondly.—Mechanical force, such as a steam-engine, or a spring.

Thirdly.—The uniform retarding force, arising from the friction of the moving parts.

Let n = sine of angle of inclination.
g = force of gravity.
m = mechanical force applied.
f = retarding force arising from friction.

Then the force resulting from the combined action of these three, will be represented by $n\,g+m-f-(m-f;)$ it is evident that the motion of the body is influenced solely by the remaining force $n\,g$, and is precisely in the same condition as if friction were annihilated.

In this case, it is evident that the body descending the plane A B, would acquire sufficient momentum to carry it up to the similar plane B C; and were there a series of similar undulations, the body would move forward without interruption, and the velocities in each succeeding undulation would be the same, and the expenditure of mechanical power would be the space passed over, multiplied into the retarding force $= s\,m$, or $s\,f$, s being the space passed over.

Instead of moving on an undulating surface, let the body be now placed on the horizontal plane A C; its motion in this condition can be influenced by two forces only, viz. the mechanical force m, and the retarding force f. If we suppose, therefore, $m=f$, it is obvious that no motion whatever can take place.

At this point of the comparison, a striking difference, and apparently not an unimportant one, exists between the undulatory and horizontal surfaces. In the former, gravity communicates a certain velocity, which is maintained throughout each succeeding undulation; whereas, in the latter, the forces, m and f merely destroy each other; consequently the body remains stationary.

This explains the experiment which was frequently repeated, and in many cases went far to *convince* several persons *of the advantage of having* an undulatory *surface. Very little reflection*, however, is *requisite to perceive that* this advantage is merely apparent, and not real; for let us suppose that the body at A, on the horizontal plane, has the mean velocity given to it, which gravity imparts to the body moving down the first inclined plane of the undulatory surface; it will then move uniformly with this velocity from A to C, and arrive at the latter point at the same time that it would have done on the undulatory line; and however the length may be increased, the body will pass over the distances corresponding to each undulation in the same space of time, whether the surface be undulatory or horizontal.

Let p = power expended in communicating any given velocity to the body on the horizontal surface at A; then the whole power expended in moving the body from A to C, will be $p+s\,m$, or $p+s\,f$.

But when the body arrives at C, it retains its original velocity, and is capable of employing its power, or of moving itself beyond C; whereas, on the undulating surface, the body becomes quite stationary at C. In short, it is a well known law in mechanics, that the velocity which the body possesses, is exactly equal to the power expended in communicating it; we therefore have the absolute expenditure of power in moving the body from A to C$=s\,m$ or $s\,f$, which is precisely the same result as on the undulating surface.

Hitherto we have the forces m and f equal, by which the friction or retarding force was merely neutralized; but in practice, m must exceed f, otherwise no motion could ensue on the level plane. When, therefore, m is greater than f, the body will be accelerated by the differences of those forces, viz. $m-f=d$; in this case the motion of the body on the undulatory surface is influenced by a force represented by $n\,g+d$.

If v and v'' represent the velocities generated by the forces $n\,g$ and d in the same time, then $v+v''$ will represent the velocity which the joint forces will generate in an equal space of time. But the velocity given by the force $n\,g$, in descending, is lost in ascending; hence, the body will arrive at the summit of each undulation, with the velocity due to the action of the force d, which is $\sqrt{2\,d\,s}$.

Now, the velocity acquired by the action of the force d on the level plane, the body having moved over an equal

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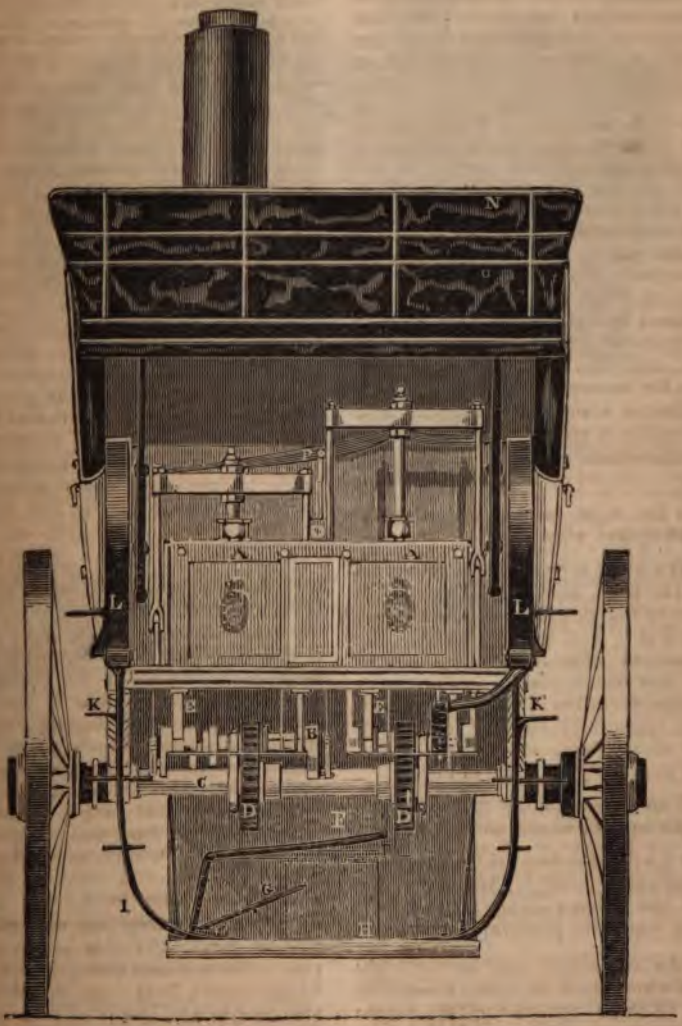

a result fraught with mischief to the undertaking generally.

I feel it, however, due to Mr. Badnall, to state that I consider a trial upon some branch road might be made with advantage, as the adoption of his ideas would certainly be productive, in many cases, of considerable saving in the first cost, which, in some branch roads, is of paramount importance.

I must, however, again repeat, that no saving of power could be by any possibility effected.

ROBERT STEPHENSON.

THE LATE STEAM-CARRIAGE INQUIRY.

Sir,—It is certainly not the least strange among the many strange features of the late Parliamentary Inquiry into the claims of Mr. Goldsworthy Gurney, that Sir Charles Dance should not have been applied to for the essential information which no one is so well qualified to give as himself. The worthy baronet's steam-trips between Gloucester and Cheltenham are continually referred to by almost every witness, and their results uniformly spoken of, as of the utmost importance to the question under consideration; and yet, singularly enough, Sir Charles himself, is never examined. And all this, too, when the committee are so anxious for information on the subject, that they receive any mere hearsay or conjectural evidence upon it with avidity.

One of the great points which Mr. Gurney wishes to establish is, that Sir Charles discontinued running on the Cheltenham-road solely on account of the increased tolls. What more easy and direct way of proving this than by putting forward Sir Charles himself? Instead of this, the committee are left to puzzle out the fact, from detatched scraps of letters, reports of old conversations, and a motley host of roundabout inferences.

Again, it is another grand point, to show that steam-carriages can run on common roads cheaper than horse-coaches. Sir Charles Dance, is here again the very individual wanted: his four months experience in Gloucestershire, is again the theme of every tongue. *Still he is not* produced; still, when fact *is every thing*, the committee have no*thing but conjecture* to go upon; and *still, when Sir* Charles Dance is the only person who can testify directly to the fact, Sir Charles Dance is left unproduced and unquestioned! And yet, on this head, also, the committee were as eager for information as on the other. It does not appear whether Sir Charles was sent for, and refused to attend, or whether it never entered into the minds of the committee, that he would be the fittest person to examine; but whatever may have been the cause of his non-attendance, the want of his name in the list of witnesses, certainly gives a very suspicious air to the whole investigation. It created some surprise that he was not examined before the committee of 1831, just after his Cheltenham carriage had concluded its four months' career,—and it is not a circumstance calculated to diminish that surprise, or to further the objects of those who would induce the belief, that travelling by steam is already cheaper than by horse-power, that he was also absent on the late occasion, when the necessity for his attendance was more pressing than ever.

In the absence of the worthy Baronet's testimony, Mr. Gurney appears to have been put to very strange shifts for supporting his broad assertion, that "the carriages *then* (1831) at work, were capable of beating the coaches in time; were *running at a profit*, and carrying the public at half fares." A plain statement of all receipts and disbursements, would have made the "profit" obtained quite clear at once; instead of this, Mr. Gurney produced a statement from Mr. Stone, Sir Charles Dance's foreman, to the effect that "the receipts had been 202*l.* 4s. 6d., and the expenses in coke altogether 78*l.*" Strong *proof* this! as if the outlay for *coke* were all the expenditure required. The proprietor of a horse-coach, might as well claim the preference over steam, on the bare ground that, in the same time, his "expenses *in hay*, were altogether" a pound or two less; without dropping a word as to his "expenses" in coach and horses, wear and tear, and repairs, duty and tolls, wages of coachmen, guards, cads and grooms, rent and taxes of stabling, farrier's and doctors' bills, cornchandlers' ditto, and other trifling et-ceteras! Mr. Gurney must be aware, that very few people suspect that the Gloucester and Cheltenham speculation was abandoned in consequence of the heavy expenditure in coke, and he might,

therefore, have spared himself the trouble of producing Mr. Stone's statement at second-hand. Nobody but himself appears to have ever considered the speculation profitable—not even Mr. Alexander Gordon, original as that gentleman's notions generally are.

If, indeed, reliance can be placed on the assertions of Colonel Macerone,* we need not wonder that Sir Charles Dance has never made much boast of his profits. The Colonel plainly and unequivocally stated that the much talked-of journeys between Gloucester and Cheltenham were performed, not with one carriage, but with three, all made to appear exactly alike, and that it required an engineer (Mr. Stone himself) at 1*l.* per day, and four men at 3*l.* per week, to keep one of the three in moving order, *especially as it was thought necessary to make the public believe that it was only one coach that performed the journey.* By adopting this explanation, a world of mystery is cleared up at once; among other things, it quite settles the question as to "profit," and goes some part of the way towards accounting for Sir Charles Dance's apparent reluctance to be examined on the point. It is rather singular that, before the committee, no allusion was made to this story of the three carriages, notorious as it has now for some time been; nor was Mr. Gurney called upon either to confirm or refute it; he would have done well to volunteer the latter, had it been in his power.

Mr. Gurney goes much too far when he so strongly insists that his carriage is now "so perfect, as to travel faster, cheaper, and safer than horse-coaches," nay, that it was "perfect at the time it stopped at Gloucester." There seems to be but too good reason for believing, that, up to the present time, steam-conveyance (on common roads) is inferior to horse-conveyance, in all three particulars; so that, *if* Mr. Gurney's dictum be correct, the idea of steam-locomotion on turnpike roads had better be abandoned at once, since it is of no use to expect any further improvements of importance.

It is to be hoped that, should the enquiry be resumed, as the committee recommend, during the ensuing session of Parliament, the witnesses will be much more closely examined than heretofore. The evidence given on the present occasion, like most of that before the former steam-carriage committee, is as vague, contradictory, weak, and unsatisfactory, as can well be imagined, and bears all the air of having been "got up" to make out a case. A good sifting cross-examiner among the committee would be worth his weight in gold, more especially in restraining the glib impertinences of such thorough "practical men" as Mr. Macneill, (the author of a certain celebrated Treatise on the Resistance of Water), who, among a host of similar absurdities, "too tedious to mention," talks in the most confident and off-hand style of the superior safety of steam-coaches, at the "speed of *seventeen miles an hour*," on the strength, chiefly, of his vast experience, gained on a memorable journey of Sir Charles Dance's carriage, *half way* to Birmingham, at the rate of some *four miles* or thereabouts in the hour!

So far as the committee have yet gone, they have obtained no data whatever—or scarcely any—for forming an opinion as to Mr. Gurney's claims to national compensation. A great deal more evidence, and evidence of a better quality, must be adduced before the conclusion can be fairly come to, either that Mr. Gurney's invention is of national importance, or, if it is, that he is justified in applying to Parliament for his reward, instead of seeking it in the straightforward way, by the exercise of his patent right.

I remain, Sir,
Yours respectfully,
H.

London, Feb. 18, 1835.

AXLETREES—"BIRCH-ROD" IN REPLY TO JUNIUS REDIVIVUS.

Sir,—As it now appears, from the subdued tone of "Junius," that it is he who would be "sick of (much) more," I shall only occupy your valuable pages with a very few remarks, which I should like him to have the benefit of, at parting.

I am no advocate for Mr. Birch's interest more than that of any other axle-

* And if the Colonel's random habits of assertion should be pleaded, let it be remembered that, although his charge was copied into the Mech. Mag. so long ago as December 7, 1833, and thus gained currency and some degree of credit, *it has never yet been contradicted by any of the parties interested!*

tree inventor; and I do not defend his improved axle-tree because he is the inventor, but because it is, in my judgment, the most perfect that has yet appeared.

"Junius" says, "I have, again and again granted the advantage of the barrels, as giving a double chance against the wheel sticking fast, against which, however, there is the objection of extra size and weight." True, there can be no question about the advantage of the barrels; but I asked him if he could conscientiously say that the extra size and weight (which he puts so much stress on) would bear comparison with a double action to the wheel? If he considers that the extra size and weight will balance the advantage of the barrels, then I am prepared to show the fallacy of his position; and if he considers that, while the extra size and weight is a disadvantage, the advantage of the cylindrical barrels which will more than counterbalance it, then the principal point I have been contending for is conceded.

I shall allow those parts of my last letter, which "Junius" quotes as contradictions, to remain as they are, until he can show that the box acts as effectually as a stay to the arm against the shoulder as the cylindrical barrels do. Before those passages he quotes can appear contradictory, he must show that it is intended to reduce the arm with the barrels to a less diameter than that which the arm without them is at the incision; and further, he must show that a circular rod of iron, or other material, will not break more readily when an incision is transversely made all round it, than if it were reduced the whole length to its diameter at the incision.

You seem, Mr. Editor, to think that I was wrong in questioning the mechanical knowledge of "Junius." But this I did not mean to do, so much as that he has possession of mechanical knowledge sufficient to outweigh the opinions of the whole of a learned society; and when we find, in the very paper (p. 165) which you adduce as unequivocal proof of his talent in this way, these words,—"the strongest form of a wheel is that in which the spokes are framed angle-wise to the nave, alternating both ways, to form a double cone"—I think I was *fully justified in* putting the questions I *did in my last letter,* and am now in my *opinions remaining* unaltered, in this respect, by any thing that has been said in reply to them.

"Junius" sneers at the idea of men composing a scientific society being learned men. I am fully aware that in such societies there are often dults and boobies too; but it is in the nature of things that the majority should be otherwise, else they would not stand; and few or none will join such institutions but those who either possess scientific knowledge, or have a desire to attain it.

I shall now lay aside the correcting "rod," for the present, only to be resumed again when occasion requires.

I remain, Sir, &c.

BIRCH ROD.

London, Feb. 21, 1835.

PARISIAN EXHIBITION OF COLONEL MACERONE'S STEAM-CARRIAGE.

Letter from Mr. James Wearn, Colonel Macerone's foreman.

Dear Sir,—On Monday last we made our first appearance on the Boulevards. We ran much too fast for the roughness of the road. Indeed, I should think that for such infamous pavements and dips, six or seven miles an hour would be quite fast enough, but instead of that, we ran from eleven to twelve, and by so doing broke our steam-pipe; fortunately we hat the new pipe by us, and I put it on in the street. We then ran round the Boulevards again, and round many squares, and all over Paris, at a desperate pace, but the steam-pipe did not break, and I now should think it will stand any thing. I am sure if you had known what roads we should have had to run over, you would not have allowed the spring so much play, or have put a joint or another curve in the steam-pipe. There is not here any such roads as in England; but we cannot help it. On Wednesday we ran the carriage, to visit his Majesty at his palace, five miles out of town. We ran extremely well, but did not dare more than twelve miles the hour, at which rate we entered the palace-yard. After being there a few minutes, his Majesty made his appearance, and seemed highly delighted. He said he would have a ride, but the queen and his nobles persuaded him not. He then told us to run up the road that he might look at us; and so we did. We ran two miles in seven minutes, and were much shaken. He seemed quite pleased with the machinery, when we merely worked the engines before him with the wheels unclutched. He received Colonel Asda with the greatest politeness and cordiality; and also conversed very freely with William and myself. He has made Colonel

, present of a very handsome gold
ox, and ten Napoleons each to Wil-
and myself. After stopping there
alf an hour, we left the palace, and
me at the rate of sixteen miles the
out on our arrival in the streets of
where we had to pull up now and
ur wheels slipped on the great round-
smooth stones, and for a turn or two
not move the carriage. This is an
r this place) which I wish you would
f remedying, when you write to me.
wonder our machinery was not injured
e shocks of the slipping, but it isnot,
got home in fine style, with the car-
as good order for the next run as it
day it was finished. The boxes of
eels are worn half an inch. To-
I shall have a pair cast of gun-
as you directed. On Tuesday we go
ailles.

Your faithful humble servant,

JAMES WEARN.

Feb. 6, 1835.

(*From the Journal de Paris.*)

Belgian journals have for the last
onths mentioned the success of a
arriage recently brought to perfection
and, by Colonel Macerone. Yester-
same carriage made its first trial at
At one o'clock it came forth from
Rue du Mont Blanc, and ran along the Boulevards, as far as the Rue Faubourg du Temple. Arrived there, it turned with the greatest facility, run the whole length of the Boulevards back again, the Rue Royale, the Place Louis XV., of which it made several times the tour. On its return, when arrived at the end of the Rue de la Paix, on the Boulevards, a large escape of steam interrupted its course. The tube which conducts the steam to the engines had given way, in consequence of the extreme action of the springs in running at so violent a rate over the rough pavement, and the numerous gutters across the streets. The injury was repaired on the spot, and the fire being got up, the carriage resumed its course by the Place Louis XV., the quay of the Tuilleries, the Place Carousel, the Rue Rivoli and Royal, again round the Boulevards, and home to the Rue de Mont Blanc. All the hills on the paved Boulevard were ascended with astonishing rapidity. The embarrassments of such a crowded thoroughfare were surmounted with far more promptitude and precision than we ever saw done by a carriage with the most docile horse. One of our colleagues was in this carriage the whole of its running above described, and he declares that there is not the least heat felt inside from the fire, and that conversation can be kept up so as to be heard at a much lower tone than in most ordinary carriages.

COMPARATIVE COST OF CANDLE-LIGHT AND OF GAS-LIGHT. BY J. O. N. RUTTER.

n it is remembered that the use
gas is a modern invention, it may
excite our surprise, that its benefits
extensively diffused, and its ad-
es so generally understood and
iated. Perhaps it would be diffi-
instance any other branch of
ic manufacture, which has ad-
more rapidly, or which has been
d by more satisfactory results,
hat of gas. Twelve or fifteen
ave scarcely passed away, since
the fashion for men of science
eneral intelligence to denounce
the plague-spot and the curse of
ge cities and towns which had
d it; whilst the smaller towns
ngratulated on certain supposed
lisqualifications, which prevented
availing themselves of what, it
nfidently asserted, would be an
le nuisance wherever it was
iced. That the progress of gas-
, during the last few years, has
arked by some important improvements, no one will deny. It is equally beyond dispute, that much yet remains to be accomplished. As there are many people in the world who are in the constant habit of finding fault with what they do not understand, it is no wonder that gas has come in for its full share of ignorant abuse. Former prejudices are, however, rapidly wearing away. It is a gratifying fact, that, in England alone, during the last two years, the number of towns in which gas has been introduced, exceeds thirty: it is still advancing; and it will continue to do so, until the inhabitants of every town in the United Kingdom, whose population amounts to 1,500 or 2,000, will participate in the comfort, the convenience, and the security, which gas-light is so eminently calculated to confer. In the various Continental states, and in America, the progress of gas-lighting has been scarcely less rapid, during a corresponding period, than in this country.

In the manufacture and management of gas, the mechanical operations, which belong essentially to the engineer, seem to be better understood and the arrangement and simplification of machinery, appears to be more assiduously studied, than that part of the process which requires the aid of the chemist; on whose manipulations depends, in no inconsiderable degree, the quantity and quality of the gas obtained from different kinds of coal; and whose judgment must dictate the most successful method of operating, under various circumstances. But, whatever might be the exact amount of information requisite for those to whom is intrusted the preparation and subsequent management of gas, there is a more numerous class by whom its general properties should be tolerably well understood; namely, those who are daily accustomed to see it in their dwellings. There are many persons in towns, where gas has been used for several years, who know no more about it, than they do about high-pressure steam, or polarized light; whilst its ordinary phenomena *ought* to be as well understood, as are those of fire and water. A familiar acquaintance with the habits and properties of gas, would operate as the most effectual preventive that could be desired against accidents, which are more frequently the offspring of ignorance, than they are of carelessness.

When it is proposed to introduce gas into a town, the first inquiries made by those who are likely to become its consumers are—'what will it cost?' 'will it be more expensive than lamps or candles?' Now, it is very well known by those who have investigated the subject, that for yielding an equal quantity of light, in an equal time, gas possesses a decided advantage, as respects the cost, over oil and tallow: hence, it not unfrequently happens, that in reply to the questions quoted above, persons are assured, in general terms, and without the least reference to the quantity of light required, or the conditions to be observed in obtaining it, that gas-light is cheaper than lamp or candle-light. A few month's trial of gas-light giving a result different from that which had been anticipated, the promoters of the project are assailed *with complaints*, blended with some very *intelligible hints* about 'misrepresentation' *having been* practised. An instance, and it is not the only one, of dissatisfaction arising from similar causes, which has fallen under my own observation, will serve to illustrate the necessity for disseminating among all classes of gas-consumers, that kind of information to which allusion has been previously made.

A. whose shop was generally illumined (!) by one candle, and that not of the largest size, namely, a dip 10 to the lb., in September 1832, determined to cast aside tallow and adopt gas. During six weeks things went on very pleasantly, but at the expiration of that period, it being ascertained that 700 cubic feet of gas had been been consumed, amounting, at 12*s.* per thousand feet, to 8*s.* 5*d.*, the new light was dismissed in no very courteous terms, and the dip candle reinstated in its former situation.

If we suppose that, on an average, one candle per night would have been consumed in A.'s shop, during the six weeks it was lighted with gas (1 candle × 36 lawful nights = 3.6 lbs. say at 7*d.* per lb. = 25,2*d.*), the cost would have been nearly 2*s.* 1½*d.* But how does the matter stand with respect to the quantity of light with which A. and his customers had been favoured? We may assume, first of all, that 4 feet of gas per hour, was the average consumption during the 36 nights, and that the gas was burning each night very nearly 5 hours, to consume 700 feet (36 × 4 × 5 = 720). The burner employed was a bat-wing, yielding a light equal to that from 8 dip candles of 10 to the lb., all burning at the same time. To be quite on the safe side, let us, however, assume the gas-light to have been equal only to that of 6 candles (36 × 6 = 21,6 lbs. at 7*d.* per lb. = 12*s.* 7*d.*), and we perceive that for 8*s.* 5*d.*, A. obtained as much light from gas, as he could have obtained from candles at a cost of 12*s.* 7*d.*; and that during the six weeks in which gas was used by him, he had a quantity of light in his shop, equal to nine months' supply from candles, burning at the rate before mentioned.

It is probable that A. had been told by one of his neighbours that gas-light was cheaper than candle-light. He willingly gave the former what he considered to be a fair trial; but as he had never been informed that the relative

he materials depended solely
quantity of light obtained from
a given time, A., when he be-
nessed of the means of illumi-
is shop to almost any extent,
ught of curtailing the supply.
equence was, that, at the end
ks, A. discovered his mistake;
is-light during that period had
d to him cheaper, but, on the
very much dearer, than candle-
as discontinued, without further
r examination.

ject I have principally in view,
ting to the public the following
f experiments, and the obser-
nd calculations suggested by
that those who are already, as
ose who may hereafter become
mers, should be furnished with
ested, as much as possible, of
technicalities, which will enable
estimate for themselves the
relative cost of gas-light and candle-light, and that they may also be made acquainted with some of the most simple conditions, which contribute to the economical employment of gas.

During the winters of 1833-4-5, having registered many hundred experiments illustrative of the illuminative properties of gas, when different quantities of it are consumed in burners of almost every variety of form, size, and structure, it occurred to me, as desirable to ascertain the value of tallow candles, with respect to the time occupied in their combustion. I am not ignorant of this having been done by others; but I must confess that I have sought in vain for uniformity in the published results, and for any satisfactory account of the conditions which were observed in conducting the experiments. The following table exhibits the particulars of my own experiments with candles:—

TABLE, NO. I.

Size of Candle.	Where manufactured	Conditions observed.	Duration of each candle.		Average duration of each size.		Average duration per lb.	
			hours.	*min.*	*hours.*	*min.*	*hours.*	*min.*
10 dip	Country	Snuffed	5	26				
.....	.....	.....	5	35				
.....	.....	.. ...	4	57				
.....	.....	Not snuffed	5	7				
.....	Kensington ..	.....	6	13				
.....	.....	Snuffed	5	47	5	30	55	0
Short 6 mould	Country	.....	8	20				
.....	.....	.....	8	27				
.....	.....	.....	8	46				
.....	.....	.....	8	56				
.....	.....	.....	7	45				
.....	.....	.....	8	44				
.....	.....	.....	8	57				
.....	.....	.....	8	58				
.....	Kensington ..	.....	8	57				
.....	.....	.....	8	36				
.....	.....	.....	8	31				
.....	.....	.....	8	56				
.....	Country	Not snuffed	9	20				
.....	.....	.....	7	30				
.....	.....	.....	8	21				
.....	Kensington ..	.....	8	35				
.....	.....	.....	8	5				
.....	.....	.....	8	56	8	35	51	30
.....	.....	.....	7	12				
Short 4 mould	Country	Snuffed	12	32				
.....	.....	Not snuffed	12	15				
Long 4 mould	.....	Snuffed	11	55				
.....	.....	Not snuffed	12	24	12	16	49	4

The average temperature of the room in which the experiments, recorded in the preceding table, were conducted, was 65°. Two, and one occasion four, candles were burning at the same time. All the candles, excepting No. 25, were placed, as nearly as possible, in equally favourable situations. They were not exposed to currents of air, by the opening and shutting of doors; but no particular provision was made to defend them from other disturbing causes: such as one or two persons moving about the room, as on ordinary occasions. I had not proceeded far in the investigation of the duration of candles, without remarking, that Count Romford must either have been greatly mistaken, or the candles employed by him in his experiments must have differed materially from those manufactured in the present day; since he has stated that *one* candle, which is kept properly snuffed during its combustion, will burn a longer time than *two* candles of the same size and weight which are not snuffed; other circumstances in each case being equal. By referring to the table, it will be seen that the average duration of an equal number of candles 'snuffed' and 'not snuffed,' differs only a few minutes. (Compare Nos. 7, 8, 9, 10, 11, = 42h 14′, and Nos. 19, 20, 21, 22, 23, = 41h 51′—difference in favour of the snuffed candles, 23′ = 4.6′ per candle.) That snuffing of candles is an economical practice, is indisputable. The quantity of light obtained, in an equal time, from equal weights of tallow candles, when kept properly snuffed, is. probably four, if not five, times greater than from candles not snuffed. The candles employed by me for the experiments before enumerated, were taken indiscriminately from several parcels as they were received from the tallow-chandler, at different times, for household purposes. The difference in the duration of candles of equal size and weight, made from tallow of the same quality, and at the same manufactory, is chiefly, if not entirely, due to some trifling difference in the structure of the wick. In this particular, uniformity is of difficult attainment. The larger the wick, the more rapidly does the combustion of the candle proceed; and *vice versa;* but, although a candle with a *large wick, will* yield a larger flame than *one with a small* wick, the light from the former will be very inferior in q to that obtained from the latte knot, or a loose fibre, attached wick of a candle, is fatal to its combustion, and unless it be ren guttering immediately ensues. A stance of this kind occurred with N which occasioned the loss of an upon that particular candle. No means were employed to preven guttering of the unsnuffed candles, were used by me in the before-ment experiments, than removing any bonised portions of the wicks, occasionally fell into them. Whe tallow of which a candle is made good quality, its wick uniformly tw and free from loose fibres—when not exposed to a current of air, or temperature, and when it is car snuffed about every fifteen or minutes, there is not much danger guttering. If, however, a candle similar structure, placed by the s that just mentioned, is not snuffe any of the carbonised portions wick removed, it is probable ths candle may be *melted* in one-fou perhaps one-third, less time than ordinary circumstances; but, it c then, with any degree of proprie said to have been *consumed.* The c No. 25, was designedly placed be two doors, and it was, consequentl posed to a current of air, occasion frequently passing through the ment. On this account, it is not inc in the general averages.

On referring to the Table No. will be found that the average du of a pound of dip candles of 10 to t is stated at 55 hours; of short 6 m 51h 30′; and of long and short 4 m 49h 4′. As 10 dips and short 6 m are, I believe, more generally used candles of any other sizes, they m selected, as fairly representing, i every-day transactions of life, the du of a pound of candles, when burnt i cession, and under circumstances imply ordinary care and economy. is generally more waste in the dip candles than of moulds. I p to make an allowance for that, by d ing 3½ hours from their average dur which will give 51½ hours for bot and moulds. Supposing we make further deduction, say of 1½ ho shall then have 50 hours as the a

duration of a pound of tallow candles, the cost of which will be, at least, 8*d*. It must, of course, be understood that a reference is here made to the employment of candles under the circumstances already denoted. When they are frequently removed from one place to another, exposed to currents of air, or a high temperature, and, as is too commonly the practice with careless servants, when the last inch or two of every candle is thrown away, the average duration of a pound will, probably, not exceed 40 hours. In instituting a comparison between candles and coal-gas, I have preferred taking the former at a maximum, because I am sure every candid reader will cheerfully concur in some abatements, with respect to candles, to which I shall have occasion, by and by, more particularly to allude.

Among the objects intimately connected with the pursuit in which I have been engaged, the relative intensity of the light obtained from candles of different sizes, made by different manufacturers, and burning under specific circumstances, has, very naturally, claimed my attention. As, however, these observations are intended to be of a popular, and not of a scientific, character, I purposely abstain from introducing any thing that may tend to perplex, rather than edify, the majority of readers.

Having obtained, what I hope will be considered, satisfactory data, as to the duration and cost of the light produced by a pound of tallow candles, when each candle is burnt in succession, it remains that we should compare these results with the quantity of light and its cost, produced by certain quantities of gas burning under favourable circumstances, in burners of different forms and sizes.*

The results indicated in the preceding table, were obtained by the mutual comparison and correction of two different methods of conducting photometrical experiments, namely, one by noting the relative distances at which unequal lights projected *shadows* of equal intensities—the other the relative distances at which the same lights produced *reflections* of equal intensities. The candles employed in all the experiments were short 6 moulds. Each candle, previously to its being adopted as an experimental candle, was tested, immediately after it had been snuffed and when yielding its maximum of light, by carefully comparing it with a gas-flame; and those candles only were selected which came up to the standard determined on; namely, the light from a jet of coal-gas, burning at the rate of 0.7 of a cubic foot per hour. The gas employed was taken off from the main, in the ordinary way, at a distance of about a quarter of a mile from the gas-works, and was measured by one of Mr. Crosley's experimental meters. The experiments extended over a period of nearly four months. They may, I think, be considered as of a decidedly practical character. The greatest variation in the specific gravity of the gas was ,020; it being sometimes ,550, at other times ,530: ,535 may be taken as its average. If we except the first three experiments, the force with which the gas was propelled through the burners, was equal to the displacement of a column of water 0.6 of an inch in height. With the bat wing burner the pressure was necessarily increased to 0.9. The number of trials, in each experiment, was generally five, but sometimes more; and this was the case both with the shadow-meter and the reflective meter. The burners were, of course, in the best possible condition, and the glass chimneys, whenever they were used, perfectly clean. All the experiments were conducted in the same room; every article of furniture, or of ornament, that was likely to interfere with the results, being invariably removed. It is but fair to point attention to the fact, that the gas was of good quality: the product of Newcastle coal yielding 17,500 to 17,800 cubic feet per chaldron. The experimental candle was snuffed about every ten minutes, the utmost care being observed to obtain from it the greatest possible quantity of light.

Already it has been mentioned, that the duration of light from a pound at tallow candles might be estimated of 50 hours, its cost being 8*d*. It is now necessary to determine upon what shall be considered a representative standard with respect to gas. As the price of gas varies in different parts of the kingdom, it will, of course, be impossible to adapt our calculations to every locality; but we may take a medium price, leaving it

* *See Table II., following page.*

TABLE, NO. II.

Showing the comparative intensity of the light obtained from different quantities of coal-gas, when consumed in burners of various forms and sizes, and under different circumstances:—

Experimental candles employed, short 6 moulds. The average height of the flame of the candles, 75 inches. Light of each candle = a gas flame from a single jet, whose height was 1.9 inches, burning at the rate of 0.7 of a cubic foot per hour. All the gas burners were of the ordinary description. Average sp. gr. of gas, 535.

No. of Exp.	Burner.	Rate of consumption per hour.	Average height of flame.	Comparative Value. With a glass chimney.	Comparative Value. Without a glass chimney.	Remarks.
		feet. tenths.	*inch. tenths.*			
1	Bat-wing	3 0	4 0 wide	——	6 candles	
2	....	4 0	4 4	——	8 ..	
3	....	4 8	5 0	——	10 ..	
4	3 hole argand	2 0	2 4 high	2.3 candles	2.3 ..	2.6 feet per hour was the greatest quantity that would pass the burner with a pressure of 0.6.
5	....	2 6	3 0	4.4 ..	4.4 ..	
6	12 hole.	2 5	1 1	3.0 ..		
7	....	.. ..	1 8	——	4.25 ..	
8	....	3 0	1 7	4.6 ..	——	
9	....	.. ..	2 5	——	7 ..	
10	....	3 5	2 0	7 ..	——	
11	....	.. ..	4 0	——	11 ..	
12	....	4 0	2 5	12 ..	——	
13	....	.. ..	4 3	——	12 ..	
14	....	4 5	2 9	15 ..	——	
15	....	.. ..	5 0	——	15 ..	Combustion imperfect.
16	....	5 0	3 8	16 ..	——	
17	....	5 4	4 6	18 ! ..	——	Combustion imperfect.
18	15 hole.....	2 5	1 0	3.0 ..	——	
19	....	.. ..	1 5	——	4.5 ..	
20	....	3 0	1 5	4.5 ..	——	
21	....	.. ..	2 0	——	7 ..	
22	....	3 5	1 7	7 ..	——	
23	....	.. ..	2 7	——	9 ..	
24	....	4 0	2 1	11 ..	——	
25	....	.. ..	4 0	——	13 ..	
26	....	4 5	2 6	13 ..	——	
27	....	.. ..	5 0	——	13 .	
28	....	5 0	3 2	15 ..	——	
29	....	.. ..	5 2	——	15 ..	
30	....	5 5	3 6	16 ..	——	
31	....	.. ..	6 0	——	16 ..	Combustion imperfect.
32	18 hole.....	3 0	1 0	2.6 ..	——	
33	....	.. ..	1 3	——	3 ..	
34	....	3 5	1 4	3.5 ..	——	
35	....	.. ..	1 7	——	4 3 ..	
36	....	4 0	1 6	6 ..	——	
37	....	.. ..	2 0	——	8 ..	
38	....	4 5	1 8	9 ..	——	
39	....	.. ..	2 4	——	11 ..	
40	....	5 0	2 0	12 ..	——	
41	....	.. ..	3 0	——	14 ..	
42	....	5 5	2 5	15 ..	——	
43	....	.. ..	3 7	——	18 ..	
44	....	6 0	2 8	17 ..	——	
45	....	7 0	3 3	25 ! ..	——	
46	....	7 5	3 7	32 ? ..	——	

for others to add to, or substract from, it, as circumstances may demand. In this town (Lymington) gas is supplied to private consumers by meter only, and the price charged is at the rate of 10*s.* per thousand cubic feet. In some of the neighbouring towns the price is 12*s.*; whilst in the more northern parts of the kingdom, whose proximity to coal-mines gives them peculiar advantages, the price is 7*s.* 6*d.*, and in some instances, as I have been informed, even less than that. For the sake of round numbers, which will simplify our computations, suppose we adopt 10*s*, as representing the cost of a thousand feet of gas; where the price is greater, or less, than 10*s*, the necessary allowances can easily be made.

Perhaps the most simple method of illustrating the uses of the preceding table (No. II.), in estimating the comparative cost of gas-light and of candle-light, will be to state a few examples.

Example 1.—B, who has been accustomed to use one candle in his shop, wishes to introduce gas in its stead—how may he ascertain its cost? If B. will content himself with the same quantity of light as one candle yields him, and which for 50 hours costs him 8*d.*, he may have it from gas at a cost of about 4½*d.* (0.7×50=35 feet.) But a gas-light of this size will not be so useful to B. as the candle, inasmuch that the former will be fixed to one particular place, whilst the latter is moveable at pleasure. A gas-light yielding light equal to that of two candles will cost, for the time just stated, about 8*d.*; but it is doubtful whether that would be so useful to B. as his solitary candle, which can be carried from one place to another. If, therefore, B. is satisfied with the light he at present enjoys, and is unwilling to incur any additional expense, by adopting gas, he had better not make the exchange.

Example 2.—C. generally employs two candles — will the substitution of gas be any advantage to him? Two candles for 50 hours cost 1*s.* 4*d.* The light obtained from a 12-hole Argand burner, burning at the rate of 2.5 cubic feet of gas per hour, without a glass chimney (Table II., Experiment 7), is equal to 4.25 candles, and will cost for 50 hours 1*s.* 3*d.* (2.5×50=125 feet). *The gas-light, it is true,* will be a fixture; but instead of the light of two candles (which, if not kept properly snuffed, will yield scarcely the light of one candle well snuffed), C. will have a light equal to 4¼ candles, without additional expense.

Example 3.—D. uses three candles, the light of which for 50 hours costs 2*s.* By adopting the plan recommended to C., and by fixing the light in a central situation, D. may have more light for 1*s.* 3*d.* than he obtains from three candles at a cost of 2*s.* Supposing, however, that D. is willing to expend the same sum for gas that he now pays for candles; how should he proceed? A 12-hole burner, consuming gas at the rate of 4 feet per hour, yields a light equal to 12 candles (Table II., Experiment 12), costing for 50 hours 2*s.* (4 × 50 = 200 feet). So that D. will thus obtain for 6*d.* the same quantity of light, that candles yield him at a cost of 2*s.*

Example 4.—E. has five candles in his shop, which is too large to be properly lighted by one fixed light. The light of five candles for 50 hours costs 3*s.* 4*d.* Two gas-burners, each consuming at the rate of 3 feet per hour (Table II., Experiment 9), yield a light equal to 14 candles costing for 50 hours, 3*s.*; but, supposing that E. is willing to pay a trifle more for gas-light than he does for candle-light, since the former will exempt him from the trouble and loss of time incident to snuffing candles, and he proposes, therefore, to burn 4 feet of gas per hour, in each burner. What will that cost him? The answer is 4*s.*; (4×2×50=400 feet) and for that sum, E. will enjoy a light equal to that from 24 fresh-snuffed candles.

Example 5.—F. requires seven candles, which, for 50 hours' light cost 4*s.* 8*d.* Three gas-burners, each consuming at the rate of 3 feet per hour, will cost for 50 hours, 4*s.* 6*d.* (3×3×50=450 feet), and yield a light equal to 21 candles. If F.'s shop or warehouse is not very extensive, it would be more economical to have only two gas-lights, because two burners, each consuming at the rate of 4½ feet per hour, yield a light equal to 30 candles (Table II., Experiment 14), and F. may, consequently, obtain the light of 9 candles, without additional cost; whilst that for which he now pays 4*s.* 8*d.*, can be obtained from gas for 1*s.* 1½*d.*

It appears unnecessary to multiply these examples, in illustration of this part of the subject. Sufficient has been said, I should suppose, to show that gas-light, when properly managed, is more economical than candle-light. Its comparative cost is not, however, the only recommendation to which gas-light is justly entitled. Gas yields a light of any required intensity, and preserves its splendour unimpaired, for an indefinite period. The light obtained from candles is, on the contrary, subject to perpetual variations, and it can be made to approximate to any thing like uniformity only by the tedious process of keeping the candles properly snuffed. Another of the advantages of gas-light, is its being susceptible of instantaneous increase or diminution, by simply turning a stop-cock; a circumstance that is of the last importance in many situations, but especially in a bed-room, or sick chamber. One of the benefits attendant upon the use of candle-light, is the facility with which it can be distributed throughout an apartment, or, when necessary, as in some manufacturing processes, the readiness with which it may be concentrated around any particular object. But this is an advantage that belongs not exclusively to candle-light. By the aid of flexible tubes, ball-and-socket joints, and a few other simple arrangements, gas-light is as capable of being transferred from one place to another, within moderate limits, as candle-light; whilst it has an additional recommendation in the steadiness and continuity of its lustre; the speedy increase or curtailment of its supply—its freedom from sparks *—as well as affording entire exemption from that troublesome, and not very cleanly process, snuffing of candles.

Another circumstance which demands especial notice, in estimating the comparative merits of candles and gas, is, that every addition made to the light from candles, can be obtained only at an expense exactly corresponding with the quantity required; whilst the light from gas can be increased without increasing, in an equal proportion, its cost.

I will endeavour to illustrate this by an example.

Example 6.—Supposing that G. usually employs 6 candles, which cost him for 50 hours' light 4*s.*, and that he requires occasionally the light of 9, or even 12, candles; it is manifest that for every additional candle, G. will incur an additional expense of 8*d.* for 50 hours; 9 candles, costing him, during that period of time, 6*s.*, and 12 candles, 8*s.* If G., instead of employing 6 candles, had the same number of single-jet gas-burners, each yielding a light equal to that of one candle, the quantity of gas consumed during 50 hours would be ($0.7 \times 6 \times 50 = 210$) 210 feet costing 2*s.* 1½*d.*, being a clear saving in the expense of light of nearly one-half; namely, 1*s.* 10½*d.* in 4*s.* But the plan just mentioned, of using gas in single jets, is one of the most injudicious that can possibly be devised. Instead of 6 separate jets, consuming together 4.2 feet per hour, if G. had one Argand burner, he may obtain from 3.0 feet per hour, a light equal to 7 candles, and from 3½ feet, an equivalent to 11 candles. (Table II., Experiments 9, 11.) The gas-burner, however, has the disadvantage of being stationary, and it is not, therefore, so useful as a moveable light. Let G. try the effect of two burners, each consuming at the rate of 3½ feet per hour, yielding together with a glass chimney a light equal to 14 candles, without a chimney to 22 candles, and costing for 50 hours 3*s.* 6*d.* ($3.5 \times 2 \times 50 = 350$ feet). Thus circumstanced, if G. wishes to increase his light, he may now do it without much additional expense. For instance, supposing him to require a light equal to that of 21 candles, he may have it by increasing the rate of consumption in each burner 0.5 of a foot per hour, which will cost for 50 hours 1*s.* If a still greater increase be necessary, a further addition of 0.5 of a foot per hour, to each burner, will enable them to give a light equal to 30 candles, costing for 50 hours another shilling. Having attained certain limits, the light from gas increases in a greater ratio than the supply of the inflammable

* I have seen it somewhere gravely asserted, that those brilliant, but very minute, scintillations, which are so commonly noticed in the blue portion of an Argand gas-flame, are occasioned by the separation and subsequent combustion of small particles of charcoal (carbon) from the gas. No such thing. The scintillations are produced by particles of dust which are floating in the atmosphere, being brought in contact with the ignited gas, and by its agency, heated to whiteness. Any *person may satisfy himself* of this by shaking a *handkerchief—or* rubbing the sleeve of his coat—*near to a gas-flame*, when there will be an abundant crop of these luminous particles.

material. Much, notwithstanding, depends on the conditions under which its combustion takes place, and on the structure and size of the burner.

To render this part of the subject more distinct, suppose we collect some of the above-mentioned data, and present them in the tabular form, thus :—

HOURS.	s.	d.		s.	d.fr.pts.
The light from 6 candles for 50 costs	4	0	or the light of each candle during that period	0	8
9	6	0	.....	0	8
12	8	0	.....	0	8
6 gas jets	2	1¼	.....	0	4 ,208

1 Argand burner consuming 3 feet per hour, the light being equal to 7* candles	costs for 50 hours	1	6		
1 Ditto ..... 3½ feet 11*	.....	1	9		
1 ..... 4 .... 12†	.....	2	0		
1 ..... 4½ .... 15†	.....	2	3		
1 ..... the gas consumed equivalent to 1 candle being 0,428	of a foot, costs for the light of 1 candle for 50 hours	0	2	,57	
1 0,318	.....	0	1	,9	
1 0,333	.....	0	2	,0	
1 0,300	.....	0	1	;8	

The foregoing phenomena are perfectly explicable; but I should deviate from my original purpose, of not encumbering the present paper with scientific details, were I now to enter upon so interesting a branch of inquiry. I purpose doing this, however, at no very distant period.

Scarcely less important to consumers, than that to which I have just now alluded, is a knowledge of the method of economising gas by extinguishing the light in one or more burners, as circumstances require, and increasing it in others.

Example 7.—H. has 6 15-hole burners, each consuuming at the rate of 4½ feet per hour, yielding together a light equal to 78 candles (Table II., Experiment 26), and consuming 27 feet of gas per hour. If H. wishes to diminish occasionally the light from 78 to 45 candles, how should he proceed? On inspecting the Table II., Experiment 22, we shall perceive that 3½ feet of gas per hour, from a 15-hole burner (with a glass chimney), yields a light equal to 7 candles, but as this will not be quite sufficient for the purpose, supposing we allow for the 6 burners 23 feet per hour, the light from which will be quite equal to 45 candles. H. may thus attain his object of diminishing the light; but the course we suppose him to have pursued is not the most economical. Let us refer again to Table II. each consuming 5 feet per hour, will, together, yield a light equal to 45 candles, consuming only 15 feet per hour. Here then is a saving effected of 7 feet of gas per hour, costing for 50 hours 3*s.* 6*d.* But it is probable that 3 burners, where Experiment 28 denotes that 3 burners, 6 are usually employed, would not distribute their light sufficiently. Then let 4 be used (Experiment 26), each consuming 4½ feet per hour, yielding together a light equivalent to 52 candles, and consuming 18 feet per hour. By this arrangement a saving will be effected of 4 feet of gas per hour. The light obtained from 4 burners, and 18 feet, being equal to 52 candles; whilst that from 6 burners and 22 feet, will be equal only to 45 candles.

The frequent references which have been made to Table II., have, I should hope, tended in some degree to indicate its utility. I will here add a few other particulars. These, for the reasons already stated, will be entirely of a practical character. And, first of all, I would direct attention to the difference in the light obtained from equal quantities of gas, when consumed in burners of different sizes. Compare Experiments 9, 10, 11, 12, 14, 22, 23, 24, 25, 26, 28, with Experiments 1, 2, 3, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42. We may hence learn what kind of burners are the most economical. In large warehouses, manufactories, churches, or other public build-

* *Let it be observed* that these results depend upon the disuse of a glass chimney.
† *These are with* a glass chimney.

ings, which are well ventilated, and whose proprietors, or managers, care nothing about the cost of light, the use of 18-hole Argand burners may be perfectly justifiable; but for shops, counting-houses, coffee-rooms, or private apartments, the most useful sizes are those with 12 or 15 holes.

An important improvement, effected lately in Argand gas-burners, is that which has been patented by Messrs. E. AND W. DIXON, OF WALSALL, STAFFORDSHIRE. This improvement consists in the apertures, by which air is admitted to the gas-flame, being contracted as respects both the interior and exterior of the burner. By this simple arrangement that fluttering motion of the flame, which is inseparable from the common Argand burner, is entirely prevented; and hence a degree of comfort is attained, the value of which will will be fully understood and appreciated by those who read or write by gas-light. There is another advantage accruing from the use of the improved burner. It economises gas—yielding a light of superior intensity to that from the common burner, the quantities of gas supplied to each being equal.* For private dwellings which are lighted with gas these burners are indispensable, and especially where the burner is fixed, as is frequently the case, just above the fire-place. A gas-flame from a common burner, in such a situation, will be in constant motion, causing no trifling inconvenience to those who work or read by it. With the patent burner the flame will be as steady, and, I think, steadier, than that of a wax candle. These burners ought never to be used without a glass chimney, which should be cleaned every day. From the before-mentioned contraction of the apertures of the burners, of course, a smaller quantity of air passes through them in a given time, than through those of the ordinary form; consequently, the current of air within the chimney, as well as the chimney inself, is preserved at a higher temperature than in other cases—a condition favourable to the more perfect decomposition and luminosity of the gas. A very common defect in burners is, that the holes through which the gas issues are too small; it is, therefore, impossible to obtain from them a good body of flame. Gas is often abused for being thin, or poor, when the fault is in the burner, not in the gas. Another mistake frequently committed in the construction of gas-burners is, that of having their diameter too great in proportion to the number of holes. The most economical form for an Argand gas flame, that is, the form by which we obtain the greatest quantity of light from the least quantity of gas, is when its diameter is small in proportion to the length of its axis. From all that I have seen of the improved burners, they appear to be constructed with great care and uniformity. They are rather more expensive than the common burners: but that is a trifle in comparison to their superiority in other respects. As I know nothing whatever of the manufacturers, I feel the less hesitation in thus stating my opinion.

No.	Size of the Patent Burner.	Rate of Consumption per Hour.		Comparative Value of Light.
		feet.	tenths.	Candles.
1	12-hole	3	0	8
2	.....	4	0	14
3	.....	4	5	17,5
4	14 hole	3	0	6
5	.....	3	5	9
6	.....	4	0	13
7	.....	4	5	16,5
8	16-hole	3	5	8
9	.....	4	0	13
10	.....	4	5	15
11	.....	5	0	18
12	20-hole	3	5	6
13	.....	4	0	8
14	.....	4	5	10
15	.....	5	0	13,5
16	.....	5	5	15
17	.....	6	0	17

Another circumstance, that should not be overlooked, is the difference in the light obtained from certain quantities of gas, when the glass chimney is dispensed with. Let it not be imagined, because I mention this, that I would recommend the general disuse of a glass chimney. The quality of the light obtained, under such circumstances, is inferior to that from a similar burner and an equal quantity of gas with a chimney. The light, moreover, is not so steady, nor of such uniform brilliancy. There are situations, however, where quantity is

* In illustration of what is stated in the text, I here subjoin some experiments, with patent burners, which the reader may compare with *those in Table II.* The candle employed was a *short 6 mould, yielding its maximum of light, and the other conditions precisely similar to those mentioned at p. 400.*

deemed of greater importance than *quality*; and it is but fair that the method most advantageous to the gas-consumer should be plainly denoted.

Much of the comfort, convenience, and economy, connected with the use of gas, depends upon proper management. The following objections are those which are commonly urged against this useful material:—

1. Gas is more expensive than candles.
2. It blackens the ceiling.
3. It spoils the goods.
4. It occasions an unpleasant odour.
5. The heat from it is in supportable.
6. Gas *must* be very unwholesome.

As a reply to the 1st objection, I need only refer to the preceding comparative statements. If a person, who has been accustomed to use one, or perhaps, two candles, expects to obtain a gas-light equal to ten or twelve candles, at the same price, he will be greatly deceived. The relative quantities of light, obtained from candles and from gas, must *always* be taken into account, in ascertaining their relative cost.

The objections 2, 3, 4, are, I believe, but very seldom heard, where gas is consumed exclusively by measure. People in general are sufficiently alive to their own interests, to guard against the wasteful employment of an article, where they have to pay for their improvidence. With those who burn gas by contract, that is, where a specific sum is paid for a light of a certain size, burning a determinate number of hours, the case is otherwise. Instances frequently occur, where, it would seem, that the contracting parties considered it their duty to get rid of as much as possible of a company's property, simply because they do not happen to be legally accountable for unnecessary waste. At Lymington, as I have before mentioned, all the gas supplied to private consumers is charged by measure. It is nearly two years and a half since gas was introduced here, and I am sure it would be very difficult to detect a *blackened ceiling* throughout the town. When gas is properly purified, and, in its combustion, subjected to proper management, it is impossible that it should 'blacken the ceiling,' 'spoil goods,' or 'occasion an unpleasant odour." The products resulting from the combustion of coal-gas, are, for the most part, precisely similar to those from wax, tallow, and oil; namely, water and carbonic acid. There is this difference with respect to gas:—under favourable conditions, all that is admitted to a burner is readily decomposed, and enters into new combinations; but with candles and oil, it is exceedingly difficult, even by the most careful management, to accomplish this desirable object. Of this we may convince ourselves by observing, during day-light, the process of combustion as exhibited by a tallow candle. If the tallow be not of good quality, and the wick carefully prepared, the flame will be perpetually fluctuating; at times elongating itself much beyond its ordinary height, then becoming, for a few seconds, comparatively steady, but emitting, at intervals, a considerable quantity of (uncombined carbon) smoke. Nothing of this kind happens in the combustion of gas, provided the supply to the burner be properly regulated. When more gas is permitted to pass through the burner than can enter into combustion, smoke, will of course, be set free; under these circumstances, neither the quality nor the purity, of the gas, afford any protection against discoloured ceilings or goods, or the diffusion of a disagreeable odour. The same effects would be produced by candles, if left unsnuffed and permitted to gutter, and by an Argand lamp, filled with oil of the best quality, if the oil was supplied to the wick in too great abundance.

The heat (5) arising from the combustion of gas depends relatively upon the quantity of light. If J. has been accustomed to employ two, or perhaps three, candles in his shop, whose dimensions are, say 16 feet × 12 feet, and on adopting gas he obtains from it a light equal to 10 or 12 candles, ought he to complain that the heat is insupportable? If J. will try the effect of 10 or 12 candles, placed as near together as they can be, and all burning at the same time, he will, I think, find the heat from them quite as 'insupportable' as that

from gas, yielding the same quantity of light. All that is necessary to prevent any unpleasant effects from the heat, generated by the combustion of gas, is a little regard to ventilation. In warm weather, this is of importance; but in winter, gas-lights are generally found to contribute very much to the comfort of an apartment; in some cases, superseding the necessity for a fire.

The last objection (6), about gas being unwholesome, I now proceed to notice.—When gas is permitted to mix, in any considerable quantities with the air in an apartment, it tends, undoubtedly, to deteriorate the quality of that air; hence impairing its fitness for respiration. There are many persons who would be very seriously inconvenienced by being shut up for any length of time in an atmosphere like that just described: but let it be remembered, that this is an *accidental*, not a *necessary*, condition, annexed to the use of gas for the purposes of artificial light. Why should the stop-cock, by which gas is admitted into a house, be left open any more than that by which a supply of water is obtained?—We do certainly, now and then, meet with a case where a careless person has left the stop-cock of a beer, or wine cask partially open, but these instances are extremely rare; and if they were thoroughly investigated, it would most likely be found that they were as much the result of ignorance as of carelessness. Where gas is used, it is an article in nightly request; a little practice enabling any one possessing common sense and prudence, to conduct the operation of lighting and extinguishing it with perfect security. No one will deny that there is something very peculiar in the odour of coal-gas, and to many persons it is extremely disagreeable: but who will undertake to account for every variety of taste? If people would forget their prejudices against gas, it appears to me that they would acknowledge its odour to be not more unpleasant than that arising from vapourised wax, tallow, or oil. What can well be imagined more offensive to one's olfactory organs, than the odour emitted by the flickering remains of a tallow candle, which have been melting and frying for ten minutes, *or more, in the socket of the candlestick?—and this is a treat* that often falls to the lot of those who burn rush-lights in their bed-room.*

The characteristic odour of gas constitutes one of its most remarkable, and, perhaps it is not too much to say, one of its most valuable properties; inasmuch that it is sure to awaken observation, and it thus operates as a preventive of accident. Those only, who have examined the subject experimentally, are aware, how small a quantity of gas is sufficient to produce a very decided effect on the surrounding air. In a room, containing 2,000 cubic feet of air, one-tenth of a foot of gas will, in a few seconds, diffuse itself so generally throughout the room, that its presence may be readily detected. There is no necessity that the odour of gas should ever be present in the apartment where it is consumed. If the fittings are unsound, they should be repaired. It is possible to employ gas-light in every room in a house without its being known; saving by its superior lustre, as compared with light obtained from other materials.† We should endeavour to distinguish between things that differ. Where several gas-lights are employed in an apartment which is not

* A light in a bed-room can be obtained superior to that from a rush-candle, by a single jet burner, consuming at the rate of 0.5 of a foot of gas per hour. Supposing a pound of 10's rush-candles to cost 7*d*., and to supply light for 10 nights—what will gas cost during the same period? If the gas-light be kept burning 9 hours each night (0.5x9x10=45 feet), the gas consumed will be 45 feet, costing say 6*d*. Instead of the single jet, it would be advisable to have a 12-hole Argand burner, as from that a greater quantity of light can be obtained when required; it also affords a ready means of heating water, or other liquids, in cases of sudden illness.

† I have had, for more than two years, 13 gas-burners on my premises; 3 are in bed-rooms, 5 in sitting-rooms, 1 in a counting-house, 1 in a passage, and the remainder in store-houses and cellars. The total length of the tubing through which the gas is conducted, exceeds 300 feet; yet have we no escape of sufficient magnitude to diffuse the odour of the gas.

From my own experience, I am decidedly of opinion that coal-gas, when largely diluted with air, is not so unwholesome as some people would try to make us believe. Scarcely a day passes that I do not respire in a vitiated atmosphere of this kind; and I have been in the daily habit of doing so for many months; but I have never experienced the slightest inconvenience from it. The men engaged at the gas-works here necessarily respire considerable quantities of gas every day, but they are in better health than they were before they entered upon the employment, two of them having, literally, grown fat.

properly ventilated, the air in that apartment will become heated, and at the same time vitiated; and to breathe such an atmosphere would, undoubtedly, be injurious to health. But this is no proof that gas is 'unwholesome.' If the same quantity of light were to be obtained from oil, or tallow, under similar circumstances, the air in the apartment would be heated and vitiated to an equal, if not to a greater, extent. The 'unwholesomeness,' therefore, wherever it exists, is due not to the gas, but to imperfect ventilation.

After all that has been said about the comparative cost of gas-light and of candle-light, I think it very possible that some, into whose hands this paper may fall, will not give themselves the trouble to verify any of the foregoing estimates and calculations, and who will be ready to say, 'Why did you not tell us what others actually pay for gas-light — not what we *ought* to pay?' For the information of that class of readers, I here subjoin, in a tabular form, for the convenience of reference, a list of some of the largest gas-consumers in this town, with the several amounts paid by them for gas, from Dec. 22, 1833, to Dec. 21, 1834, stating also the number of lights employed by each. I beg it to be observed, that these are *constant* consumers—that is, they require a light for a shorter or longer period, on every lawful night throughout the whole year. The shops are kept open until 9 o'clock in winter as well as summer, and on Saturday nights they are generally open an hour later. Of course the following table presents only specimens. I could have extended it, but I think the reasons are sufficiently obvious why I should not do so. I may, however, be permitted to add, that the cost of gas per night, to the *majority* of consumers here, is below any one of those in the list I have selected. I have taken the maximum, because I wish, if I err, to be on the right side. The rental of meters and service pipes is not included in the 'annual cost'—as some persons purchase the former, whilst others rent them. The rent is 4*s.* or 5*s.* per annum, according to their size, for the meters; that for the service-pipes, 2*s.* per annum. The interest of capital expended in gas-fittings also constitutes an additional item.

TABLE, NO. III.

No.	No of lights.	Annual cost at 10*s.* per m. feet.	Average cost of each light pr. night—say 312 lawful nights.
			d. fr. pts.
1	1 light	£1 11 0	1.192
2	1 ..	2 3 0	1.654
3	2 ..	3 1 0	1.174
4	2 ..	3 15 0	1.443
5	2 ..	3 12 0	1.353
6	2 ..	2 18 0	1.116
7	2 ..	3 13 0	1.404
8	3 ..	4 13 0	1.193
9	3 ..	8 8 0	2.155
10	3 ..	5 12 0	1.436
11	3 ..	6 14 0	1.718*
12	4 ..	5 19 0	1.145
13	4 ..	7 11 0	1 500*
14	5 ..	6 18 0	1.327
15	5 ..	12 9 0	1.923*
16	7 ..	17 3 0	1.885

Respecting one of the above, namely, No. 9, it is right that I should mention why the cost is greater than in any other instance—it is, that in the winter one light is kept burning during the greater portion of the afternoon. No. 15 burns one, and sometimes two, lights until midnight. The light at No. 16 generally averages, from each burner, that obtained from 15 candles.

J. O. N. RUTTER.

Lymington, Feb. 21, 1835.

CULTIVATION OF SILK IN ENGLAND.

Sir,—In the 594th number of your valuable Journal, is inserted an article on the cultivation of silk in America, which has induced me to send for publication the details of an experiment, the result of which, I think, demonstrates the practicability of cultivating silk in England to advantage.

In 1832, Mrs. Simpson had a few silk-worms presented to her as a curiosity, never having seen any before; these went through their transformations; one of them happening to be a female, deposited upwards of 300 eggs, about 250 of which hatched in May, 1833, but during the time of feeding, the number was reduced

* Those marked * are innkeepers.

to about 200, which perfected their cocoons; these were carefully reeled, and the chrysalises placed in bran, where each became a perfect moth; the females deposited a great number of eggs, which hatched on the 3rd of May, 1834, and the succeeding days, until we had from 12 to 14,000, or more; it was now that Mrs. Simpson became anxious to try what could be done with silkworms in England, although under great disadvantages, being in the midst of a manufacturing town, and not near any mulberry trees. The worms were fed with fresh lettuce, four times a day, for about three weeks; then, through the kindness of some friends, she had access to two mulberry trees, so that for the next three weeks they were fed on a mixture of lettuce and mulberry; at this time she heard of several mulberry trees, at the distance of 7 or 8 miles, others at the distance of 12 or 13 miles; but distance did not damp her ardour; she obtained consent, and gathered as many leaves as she could carry, and in this way supplied the increasing wants of her large colony of caterpillars, which now exceeded any thing she had anticipated. From the sixth week, she exerted herself to the utmost to supply them wholly with mulberry, and succeeded, although the quantity they consumed would appear almost incredible to those unacquainted with the voraciousness of these animals. The leaves were chopped, and the vessel in which they were taken to them was a 20-quart can, and this, filled four times a day, was barely sufficient; however, about the eighth week, they began to assume that beautiful transparent hue that betokens maturity; I at this time weighed some of them, and found that ten of them weighed an ounce (troy). We then provided them with a quantity of well-dried heath and clean straw, in both of which they formed their cocoons, the whole weighing about 18 pounds (troy), a quantity which we thought satisfactory.

I then constructed a reel, and Mrs. Simpson and one or two of the children commenced the process of reeling. Having selected a few of them for seed, we destroyed the remainder, by exposing them to the steam of water for a few minutes.

Indisposition has prevented Mrs. Simpson from finishing the whole; but from *what has been already* reeled, we shall have about 30 oz. (troy) of organzine, and about 12 oz. (troy) of floss. The article of waste will be great, owing to our inexperience in reeling off the cocoons.

If you think the above worth laying before the public, I would recommend the following practical use to be made of it. I believe there are few cottages in the agricultural counties without a garden and orchard: then I would suggest that the owners plant 30 or 40 mulberry trees in the hedge rows, which will grow freely in any part of England; and then the mother and children of a family might attend to the worms, and in this way, I have no doubt each cottager might produce 100 lbs. of silk, or upwards, each year; and the reeling process alone would occupy a great number of hands.

In conclusion, I feel convinced, that if the cultivation of the silkworm was persevered in, as (I think you will admit with me) it deserves, it would prove a valuable source of national wealth to this country, which has been hitherto neglected, or overlooked.

I remain, yours respectfully,
J. W. SIMPSON.

Preston, Lancashire, Feb. 23, 1835.

P. S —We have preserved a greater quantity of seed for this season than we possessed the last; and when we have gathered our next year's harvest, we will give you information of our success.

THE PORTLAND BREAKWATER — CHANNEL ISLANDS—SOUTH OF FRANCE, AND MEDITERRANEAN.

(From the *Guernsey Star.*)

We may apply the following lines of Addison to the writer of the following letter addressed to Mr. Harvey, which we beg to present to the public, feeling assured it will interest our readers:—

"I am always beating about in my thoughts for something that may turn to the benefit of my dear countrymen."

To Mr. Harvey.

Sir,—I hope that you will not think that the idea of your father's and your Breakwater in Portland Roads, has quite driven the little sense I possessed out of my head. I see so much national advantage from it,

and am so perfectly persuaded of its utility, that I could (and at a future time will) say a great deal more about it. But I have now other objects to which I would draw your attention. I wish to say something of the islands, and of the prospect which we have of making them useful, towards a free and constant communication with other very important parts of Europe. But first of the islands: I think large tracts of country less encouraging to human intellect and human industry than smaller ones. There is concentration in small communities; large countries may have numbers, but there is great diffusion. Guernsey and Jersey have all the requisites to forward plans of magnitude and importance. Having been observing the Government steamers for some time, and most nights, when on duty, seeing them smoke outwards and homewards, without any accident of material consequence, let the wind and sea rage as they might, I can perceive no reason for not supposing them as celebrated for safety and for work as the mail establishment of this country, and I do not see why a regular post should not be established from Weymouth (as now to Guernsey and Jersey) onwards to St. Maloes, and to the South of France, Spain, and to all parts of the Mediterranean bordering on their shores. After passing Weymouth, which I should look upon as a salient point, (which it must be if your Breakwater be established, as I have before shone,) our islanders would take up the business, forward whatever was committed to them in the best manner to St. Maloes, and if Louis Philippe would read *out of our book*, the French would catch the infection, transmit the mails and passengers to Rennes, and thus give them that *celeripede* character of which they are so fond of boasting. Our friends at Guernsey and Jersey have plenty of activity to urge the Frenchmen on, to spur them to provide *necessary* accommodations, and to show them what exertion will do, and then we may take a trip to the South of France with very little trouble, and our letters would reach the whole coast of the Mediterranean and all the country of the Pyrenees, in the short space of a few days. A line of activity thus established in France would, I am convinced, improve that large and diffused country, and would show the French what we Englishmen mean when we speak of *the London Road*. We should only have to turn to our own purpose some of the exertions of our two little industrious islands, Guernsey and Jersey. They would forward our views, would become the fulcrum of this increased intercourse, and instead of supplying the quota of their bravery and their wealth in augmenting the splendours of conquest, *would themselves* be infinitely benefitted *by the peaceful* enlargement of commercial communication, and be the means of spreading the parent country's and their own civilization, throughout those parts of France and Spain which, at the present moment, are in deplorable want of every circumstance tending to that point.

The steam-packets at Weymouth are at present, with a little management, but slightly affected by the state of tides; for they are true to their time of sailing, and carry the mails regularly to the islands. If Weymouth, under these circumstances, now prove so greatly superior to any other port for the transmission of the post, and for landing of letters from all our homeward-bound ships from India, &c., what would it be were the Breakwater once made efficient? A harbour would then be opened to the ships themselves, uninfluenced by the tides or by the winds, blow as they may from any quarter; no long reach of winding navigation to encounter, and no fear whatever of muddy sand banks or dangerous shallows. The deep and open sea would at once deliver its richly-loaded treasures into a harbour locked in on all sides from the winds, presenting an area of *four square miles*, with full depth of water, whatever state the tide might be in at the time.

According to the foregoing observations, if the islands were made available to these objects, and the French were to co-operate in earnest, letters and passengers might safely reach the banks of the Loire, whilst our mail communicated to and fro with the metropolis. But I must finish this letter, not however without saying that incalculable will be the advantages, in a commercial and national view, of a Breakwater in Portland Roads.

Sir, your friend,

Weymouth, Feb. 14, 1835.

THE ART OF BOOK-BINDING.

Of the works hitherto published in this country on the Art of Book-binding, or, as it is sometimes fantastically termed, the Art Bibliopegistic, there is not one "that can be placed in the hands of the workman calculated to assist him in the most important manipulations of his art." So Mr. J. A. Arnett affirmeth —himself a workman of no mean skill and experience — in the Preface to a small work* intended to supply this not unimportant deficiency in our litera-

* Bibliopegia; or the Art of Bookbinding in all its Branches. Illustrated with Engravings. By John Andrews Arnett. Pp. 218. 18mo. Groombridge, 1835.

ture; and so we can from some small knowledge of our own, as amateur practitioners of the art, certify to be the case. The French have two or three excellent works on this department of art, and have greatly excelled in it—most of our finest descriptions of binding, having been derived from them; but the only English author on the subject, whose labours are worth mentioning, is Dr. Dibdin, who has written upon it in his "Decameron" with great taste and a most rare enthusiasm; and his work is of too costly a description, to be accessible to the generality of those who would be benefitted by the many valuable practical hints which it contains.

Mr. Arnett's "Bibliopegia" embraces the *practice* of the art only, and as it exists in this country, but he promises "next summer" a companion volume, in which he will give its "history from the earliest period to the present time," including "sketches of by-gone binders and amateur professors of the art," and "notices of the modes of book-binding in different parts of the globe." So far as he has gone into the subject in his present volume, he has done it great justice. He describes every process to be gone through in binding a book, from the folding to the finishing—as also every variety of binding, from plain calf to gorgeous arabesque—with such circumstantial minuteness and in such clear language, accompanied too with so much judicious advice and tasteful suggestion, that a person who had never before seen a sewing press or gold trindler in his life, might, with no other assistance, soon become a most accomplished binder. He anticipates that this, which constitutes the excellence of his work, will cause it to be regarded by some of his brethren as injurious to the craft; but "science," as he justly observes, (though perhaps *art* would have been the better word) never lost by its general diffusion, and the clever workman will ever retain the elevated position which his taste, ingenuity, and attention entitle him to." The many excellent lessons in taste, which Mr. Arnett quotes from Dr. Dibdin, may suffice to show that amateur book-binders are capable of conferring obligations on the art, fully equal to any *benefit they can* personally derive from *it. Take, for example,* the following *delightful extract from* Dr. Dibdin, on the general external character of a library:—

"The general appearance of one's library, is by no means a matter of mere foppery or indifference; it is a sort of cardinal point, to which the tasteful collector does well to attend. You have a right to consider books as to their *outsides*, with the eye of a *painter*; because this does not militate against the proper use of their contents.

"Be careful of red morocco or vellum; they have each so distinct, or, what painters call spotty, an appearance, that they should be introduced but circumspectly. Morocco, I frankly own, is my favourite surtout; and the varieties of it, *blue* (dark and light), *orange*, and *green* (*olive colour*,) are especially deserving of your attention.

"Let *Russia* claim your volumes of architecture, or other antiquities, of topography, of lexicography, and of other works of reference. Let your romances and chronicles aspire to *morocco* or *velvet*; though, upon second thoughts, *Russia* is well suited to history and chronicles. And for your fifteeners, or volumes printed in the fifteenth century, whether Greek, Latin, Italian, or English, let me entreat you invariably to use *morocco*; for theology, *dark blue*, *black*, or *damson colour*; for history, *red* or *dark-green*; while in large paper quartos, do not fail to remember the *peau de veau* (calf) of the French, with gilt upon marble edges! My abhorrence of *dogskin*, urges me to call upon you to swear eternal enmity to that engenderer of mildew and mischief. Indeed, at any rate it is a clumsy coat of mail. For your Italian and French, especially in long suits, bespeak what is called *French calf binding*; spotted, variegated, or marbled on the sides, well covered with ornament on the back, and, when the work is worthy of it, with gilt on the edges. Let your English octavos of history, or belles lettres, breathe a quiet tone of chastely gilded white calf with marble edges; while the works of our better poets should be occasionally clothed in morocco exterior."

Mr. Arnett repeats these precepts on library picturesque with well-deserved reverence; but there are some observations of his own, on the attention which ought, at the same time, to be paid to the insides, or what is technically called the *forwarding* of books, not less worthy of quotation:—

"Let it never be lost sight of, that the proper *forwarding* a book, is the great desideratum of all good bindings; the general appearance of the gilding and other ornamental operations being merely subservient

to it. The early binders were rigid upon this point, as is seen by their statutes and rules, Edition 1730; and so particular were they that their books should be well forwarded, that the 36th article enacts, 'Be it held that the master binders do sew all their books with thread and real bands—do back them with parchment and not paper; and in case of infringement, the said books shall be done again at the expense of the infringer, who shall besides be condemned *to a fine of thirty pounds for each volume.*" Care is of the utmost importance when the book is valuable, either from its rarity or the splendour of its embellishments, such works daily increasing in price; for if carelessly or badly bound, the re-binding and consequent cropping the book down, by recutting the edges, tends considerably to deteriorate (detract) from its value; a good margin being a primary object to the genuine book-collector. Many have contended that there is no occasion for this extra care in forwarding, since for a moderate sum other copies might be obtained, and thus the solidity and elasticity of the binding have been sacrificed to the general *coup d'œil* of the finishing. Let not the binder, however, hazard his reputation on the effect thus produced, which will not be lasting; but rather let it be his ambition to produce such work as will bear the test of examination in every part, opening with freeness, and presenting an appearance at once firm, square, and compact. Should the possessor of a library limit his binder to a price, he will do well to sacrifice a portion of ornament (which adds nothing to the durability) to the charge necessary to be made, for extra care in the earlier stages. Let them not be tempted by an elegant marble upon the cover, and upon the edges—by a border full of delicacy and taste—by a gilding that pleases the eye, or by the gold spread with profusion upon the edges, the back, and the sides, to the neglect of the more important details of folding, sewing, cutting, &c."

In this extract the reader has a very fair specimen of the workmanlike spirit in which the whole of Mr. Arnett's book is written; he very properly makes the *beau ideal* of good binding, to consist in having both inside and outside done in the best style of the art. He likes variety, and likes embellishment, but he would have each sort of binding—be it ever so humble or superb—the very best of its kind. We are now about to take our leave of him, but before doing so, we must make one other extract from his pages, *descriptive of a sort of* binding, *recently introduced into* this country, which is supposed to exceed in magnificence any thing ever before witnessed in this branch of the art.

"*Illuminated Binding.*

"This style, an invention of our neighbours the French, and, for some time, by them kept with the greatest secrecy, has been, after much expense, introduced into this country by Mr. Evans, bookbinder, of Berwick-street, Soho, London. It is a binding of the utmost magnificence, uniting the varied beauties of the arabesque and gilt ornament, blended with the illuminated decorations seen on early MSS., before the invention of printing. When executed in the best manner, nothing can exceed the beauty of the whole *coup d'œil*, rivalling, as it does, the most elaborately finished design of the painter. The time that requires to be devoted to the production of even one specimen, must ever confine this sort of ornament to the finest treasures of literature, and even to them in a limited degree. Practice and a taste for the arts will here alone serve the workman: without these requisites, it would be futile to make the attempt. But as the proceedings require to be executed with the utmost care, we shall enter fully into such as are new, and from their importance, at the risk of being considered prolix, again touch on those that may have been before treated of. The description of one side will serve the purpose of making the process fully understood. Whether the material be of morocco or white vellum, it must be washed, if required perfectly clean, and left to dry. The first operation will be to place the side on the bed of the arming press, and boldly impress the design thereon. The most elegant, and capable of the greatest display of colour, are subjects of botany and natural history. The next step will be to glaze, with a camel's hair pencil, such parts of the impression as it is intended shall be afterwards covered with gold. This done, the delicate operation of colouring may be proceeded with. In London and Paris, this is executed by professed artists in no way conversant with book-binding. The colours to be used, must be such, as do not at all, or very slightly, fade, on exposure to the sun or air; such as carmine, ultramarine, indigo, burnt sienna, gamboge, and sap green. These must be prepared with fine gum, in the same manner as for painting, and be as lightly and delicately laid on such parts of the design, as it is intended the colour should occupy, taking care that the ground colour, or leather, be entirely hid. Let every thing be true to nature; each bird, plant, and flower, its proper colour, and a general harmony prevail throughout. When finished, let the whole perfectly dry, and then, in the manner directed lay gold on such parts as

it is intended, in the re-impression of the plate, should be further embellished. Heat the plate, place the side again under it, and give it a firm and sharp impression. Rub off the superfluous gold, and the whole of the delicate lines of the ornaments will be found beautifully gilt, the colours firmly fixed by the heat of the plate, and the rough edges of the colour completely effaced by the re-impression of the original design."

We shall look forward with no small interest to the additional volume, in which Mr. Arnett promises to supply the "History of the Art;" and sincerely hope that he will find in the success of the present, every possible inducement to prosecute his task to its conclusion.

ISOMETRICAL PERSPECTIVE, AND ITS PRACTICAL APPLICATIONS.

Since Professor Farish's discovery (for such it may be truly called), of that system of perspective, to which he gave the name of Isometrical Perspective, and the extensive publicity given to it by the transference of his paper on the subject from the comparatively neglected pages of the Royal Society's Transactions, to Dr. Gregory's widely circulated "Mathematics for Practical Men," and more especially since the publication of Mr. Jopling's excellent "Practice of Isometrical Perspective," a taste for this description of drawing, founded on an increasing conviction of its superior advantages, has been fast gaining ground among all classes of draftsmen.

The productions of Farish and Jopling have not, however, so exhausted the subject, but that we are free to give a hearty welcome to another and still larger work upon it, which has just made its appearance, from the pen and pencil of Mr. T. Sopwith, land and mine surveyor, of Newcastle-upon-Tyne*. Mr. Sopwith's work is dedicated to Mr. Buddle, the eminent Coalliery viewer, and is stated to have been "written expressly at his suggestion—" Mr. Buddle, conceiving that the advantages of this method of delineation stood in need of some further exposition, "more especially as relates to geological and mining plans and sections." When Mr. Buddle threw out this suggestion, Professor Farish's essay was the only one that had been published on the subject, and it seems that 128 pages, that is, nearly one-half of Mr. Sopwith's work, had passed through the press before he received the first number of Mr. Jopling's "Practice," of which he speaks (as it deserves) in very handsome terms. We do not imagine, however, that an earlier publication of Mr. Jopling's work would have taken away the inducement to produce the present; for the former is confined to the practice of the art in the abstract, and the latter, derives its chief value from the light which it throws on various practical applications of it—some of them of a very peculiar nature.

Mr. Sopwith commences with a general chapter, on "Mineral Plans and Surveys," in which he enforces at great length, and with no small ability, the importance of of "a more general and scientific system of recording the progress of mineral works, in the great coal and lead mining districts of the United Kingdom;" in order that adventurers may have something better than mere chance to depend upon, in commencing new works, or re-opening old ones.

"A reliance on chance instead of science, as the presiding genius of mining adventure, must sooner or later affect its own existence, by demonstrating that the singular instances of good fortune which sometimes occur, bear a very small proportion to the numerous undertakings which begun and continued without any means of appreciating the employment of capital and the condition of the works, end in disappointment and create a highly injurious prejudice against mining speculations. This prevailing idea of the uncertainty of mining adventures, and a consequent disregard of method in conducting them, are especially detrimental to the interest of such districts as mainly depend on private adventure for the discovery of the mineral treasures they contain. The *prospects* of mining, cannot, indeed, be reduced to a certainty, but it is exceedingly desirable that all *the details of conducting it* should be so. An intelligent system of this kind, would attach to it a character of skill and method, for want of which, it is much undervalued as a means of employing capital, and an opening has been thus afforded to impos-

* A Treatise on Isometrical Drawing, as applicable to Geological and Mining Plans, Picturesque Delineations of Ornamental Grounds, Perspective Views and Working Plans of Buildings and Machinery, and to General Purposes of Civil *Engineering*, &c.: with 34 copper-plate engravings. *By T. Sopwith*, Land and Mine Surveyor; *Member of the Institution of* Civil Engineers, &c. *Pp. 239, 8vo. Weale, 1835.*

tions, which have greatly lessened the public confidence in such undertakings.

* * * *

"The situation and extent of the various mines which have from century to century been presented, might have been clearly delineated and preserved, at an expense exceedingly small, in comparison with the expenditure of mining, and would have proved of incalculable value in promoting the interests of mining, and the advancement of geological science. Not only ought such records to consist of mere plans and sections, but should be accompanied by explanations of the reasons why they were forsaken, in what state the several workings were left, and whether there remained in them any inducements for the expenditure of capital in further adventures.

* * * *

"Plans after plans have been lost or destroyed, which, if now in existence, would be of infinite value, and which might have been preserved at an expense infinitely short of any thing like commensurate with the value of possessing such data concerning the mineral wealth of a district. An intelligent mining director has informed me, that plans and sections of the old workings, in a district under his management, would have saved many thousand pounds; and such must ever be the result of neglecting this important department of practical mining."

The careless and imperfect manner in which mines are now surveyed, and mining operations recorded, almost exceeds belief.

"Most mining plans consist merely of outlines of the course of the principal workings, without any delineation of the several strata, or of the relative productiveness of the works at different periods. Sectional plans, which are of great utility, are far from being general; *and I know of one establishment only in which a regular series of them is preserved.*"

Mr. Sopworth here alludes more particularly to the lead-mines of the North of England, with which he is professionally acquainted; but it would appear from the following extract, from a paper read by Mr. Buddle, before the Natural History Society of Newcastle-upon-Tyne, that though the case is so far different in the coal-districts, that the viewers usually keep regular working plans of the various workings, yet each of the plans has so *little reference to the others*, that, *considered as a collection* of land-marks for further guidance, they are of little if any value:—

"It is obvious that many collieries, which are now open, will, sooner or later, be shut up, and be dormant for various and indefinite periods; and the probability is, that, in many cases, all knowledge of the dykes which intersect them may be lost, and that the parties having to re-open them, may be as ignorant, or even more so, than even those who first opened these mines. It is not necessary that I should dwell on the extent of the loss of property, and of lives, which may result from such a state of things. My object is to draw the attention of the society and of the public, to the means of avoiding it. Although the several dykes which have been met with in all the working collieries of the present day, are accurately represented on the working plans of these collieries, yet, from the detached and local nature of those plans, no general and accurate notion of the lines of direction, leadings, and throws, can be formed from such detached sources of information. Nothing can effect the object of gaining an accurate knowledge of this important feature in the geological structure of our district, but the construction of a map of it, laid down from actual survey, on which all the dykes that have been yet discovered shall be correctly represented. This map to be accompanied by a book of sections, and having the throws of the dykes in every part of the district."

The measures expedient to be taken for the establishment of a better system, are treated of by Mr. Sopwith, under five different heads. 1. "Collection of Existing Data." 2. "Geological Surveys." 3. "Geological Plans and Sections." 4. "Preservation of Mining Plans and Records, and 5. "Geological Map of the North of England."

The proprietors and conductors of mines, and all under them, would do well to study the whole of these sections attentively. The author's suggestions are all of a very sensible and practical character; accompanied with every necessary instruction for carrying them into complete effect.

In speaking of the assistance to be derived from the existing county maps, in forming a "geological map of the north of England," Mr. Sopwith gives some startling illustrations of the small dependance that is to be placed on their accuracy:—

"The mining manor of Allendale, consists of two valleys, formed by the east and west Allen rivers. In two recently published maps

of the county, *the distance of these rivers is a mile different*, for nearly the whole extent of these respective dales.

"From the mining village of Coalcleugh to that of Allenheads, on one map is 5¼ miles, on the other 3½ miles, being a difference of 1¾ mile in this short distance.

"The boundary between Alston Moor and Allendale, from the north-east to the south-west extremity of Alston Moor, is on one map 7½ miles, on the other 5½ miles.

"From the same north-east angle of Alston Moor, to a prominent angle of the county boundary, south of Allenheads, is on one map 11¼ miles, while the same points on the other map are between 8¾ miles; these several distances being all measured in direct lines from point to point."

Miles wrong! where it is of such extreme importance to be correct, that to be even a single yard wrong has been known to involve a difference of a thousand pounds. There is a working vein of lead, well known in the north, by the name of the Rampgill vein, which at its intersection with the boundary between Alston Moor and Allendale—one of the very examples of error just quoted—is estimated to be worth 1,000*l.* per yard (in length.)

Mr. Sopwith's Chapter II. introduces his readers to "Isometrical Projection." He first points out the advantages and defects of ground plans, sections, and elevations, on the ordinary method; and then shows the great superiority of the isometrical system of projection, more especially for geological and mining plans. An "Elucidation of the Principles of Projection" follows, (occupying about 50 pages,) which has been contributed to the work by Mr. Peter Nicholson, and displays, like most of the productions of that useful, but ill-rewarded, writer, great ingenuity, profoundness, and originality, wrapped up in a network of symbolical enunciation, by no means favourable to clearness of comprehension. Nicholson, like Bentham, is one of those lights of the age, who require translating into their mother tongue. On the name given by Professor Farish to this manner of delineating objects, he makes the following acute and (we think) just remarks:—

"Professor Farish was the first to observe *that in projecting* solids comprised under *rectangular faces, that* if the projecting rays *were parallel to the* diagonal of a cube, having *its faces parallel* to the faces of the solid to be projected, he would be enabled, by a common scale, to draw the representation taken, without the trouble of actual projection, in such a manner, that all the right angles would be represented in the drawing, either by angles of 60° or 120°; and that all the right lines or edges of the solid would be represented by right lines, which would have the same proportion to one another as to the corresponding edges of the original. It was from this circumstance, that Professor Farish denominated the projection arising from the diagonal position of the projecting rays, *Isometrical perspective*. The substantive *perspective* is not, however, so strictly applicable as *projection*: for perspective implies a representation of an object, by rays proceeding from the solid *to a point at a limited distance*, and in their progress intercepting the plane of the picture; whereas in projection, the rays are supposed to be parallel, and consequently would never meet in a point as in perspective. It is therefore proper to substitute *projection* for *perspective*, and to call this mode of projection, isometrical projection."

Chapter III. treats of a modification of isometrical projection, to which Mr. Sopwith gives the not very significant name of Isometrical *Drawing*—by the use of which, he thinks this method of delineation may be made more generally applicable "to the ordinary purposes of plans and sections."

"If a cube of 3 feet be drawn isometrically, every side of the isometrical cube will be 2.449 feet; that is, they will be in the ratio to the originals of $\sqrt{2}$ to $\sqrt{3}$, if drawn by the ruler of projection, or in other words, if drawn as such a cube, would actually appear to an eye placed at an infinite distance, and endued with perfect vision. It is, doubtless, this result of the laws of projection, which has long prevented its application to the ordinary purposes of plans and sections; for as the measurement of the objects represented would require a constant enlargement, according to this ratio, it would necessarily become so abstruse and complicated, as to be useless for practical purposes. * * * The true isometrical projection of a house, or any other object, would require a scale different from that which measures the common ground plan, or vertical section of the same object; and the process of isometrical projection, however simple, when regular bodies are to be represented, would be a work of infinite labour, when applied to the numerous and complicated lines of an architectural design, or a land or mineral survey. But since, as appears by the demonstrations in the preceding chapter (Mr. Nicholson's), isometrical figures are proportional in all their directions,

the drawing may be enlarged so much, as to admit of the application of the same scale, which applies to the orthographic representation. * * Thence in this and the subsequent chapters, the terms isometrical *drawing and planning* will be substituted for *projection*; and by isometrical plans, drawings, and sections, are to be understood, not the geometrical projection of the objects, but such a proportional enlargement of the same, as to admit of the application of a scale on the same manner, as to a common ground plan and section of the same objects."

The propriety of such a modification of the true isometrical, has been also pointed out, though but briefly, in Mr. Jopling's treatise. Mr. Sopwith illustrates at great length, and by many excellent plates, the practical facilities which it affords. An intelligent correspondent of the "Architectural Magazine" has shown, however, that a very clear idea of it may be given in extremely few words:—

"An isometrical *drawing* of a house is nothing more than joining the front and end elevations, and the vertical profile of the roof together; but instead of drawing the level lines horizontally, as in geometrical elevations, those of the right hand elevation are drawn on an angle of 30° to the bottom of the paper, but the reverse way. Any one who will but make the trial, will find he can scarcely go wrong. The lines almost of themselves fall into their places as freely, by just moving the pencil, as any well-disciplined troops."

Chapter IV. treats of the "Application of Isometrical Drawing to Geology and Mining."

From this, it clearly appears that all the data obtained by mineral surveys may, by this method of representing vertical and horizontal planes in one drawing, be condensed within an extremely small compass. Mr. Sopwith exhibited, some time ago, to the Institution of Civil Engineers, a geological plan of part of Alston Moor, in which the aqueduct of Nentforce level, the interior of a lead mine, the disruption caused by the mineral veins, and a large extent of the surface of the country, were all shown in a clear and intelligible manner, on a drawing 28 inches by 22 inches.

Chapter V. is devoted to "the Application of Isometrical Drawing to Ornamental and Landscape Gardening"—which, more than any other, requires the union *of the plan and picture in* one drawing.

Chapter VI. and last, embraces its application to "Plans of Buildings and Machinery, and to general purposes of Civil Engineering." Among the examples given of the advantages of isometrical projection in this department, there is one which we would particularly recommend to the attention of our railway friends:—

"In various surveys of projected new lines of roads and railways, the author has had occasion to take accurate levels of the principal streets and roads of towns, or of adjacent railways, preparatory to determining the best lines of direction for the intended work. The sections thus obtained were laid down on isometrical plans, and by drawing lines in any direction, and at various rates of inclinations, it could at once be easily ascertained at what depth such lines passed under the surface of the respective sections, so that, in *a few minutes*, information could be gained as to the respective levels and depths of each line which it would require considerable time and calculation to obtain, from ordinary plans and sections."

We are, upon the whole, very much pleased with Mr. Sopwith's "Treatise;" it is not only the fullest, but, in point of practical illustration, the best which has yet appeared on the subject of isometrical projection; and from its popular style, and the elegance of its embellishments, is eminently calculated to extend the use of this very superior method of graphic delineation.

LIST OF NEW PATENTS, GRANTED BETWEEN THE 22D OF JANUARY AND 22D OF FEBRUARY, 1835.

William Evatt Wright, of Regent-street, Westminster, gentleman, for certain improvements in tea and coffee-urns and tea kettles. Jan. 27; six months to specify.

Joseph Gibbs, of Kennington, and Joseph Gatley, of Whitechapel, engineers, for certain improvements in machinery for cutting wood and other materials. Jan. 27; six months to specify.

William Morgan, of the Kent-road, Surrey, Esq., for certain improvements in steam-engines. Jan. 27; six months to specify.

John Budd, of Liverpool, merchant, for a certain improvement or improvements in printing silk, cotton, calico, or other fabrics, and in the manufacture of blocks, cylinders, or rollers, used for such purposes. Jan. 27; six months to specify.

Isaac Dodd, of Horsely Iron Works, county of Stafford, engineer, for certain improvements in machinery for cutting and shaping wood and other materials. Jan. 29; six months to specify.

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Railway Converts.—Colonel Macerone has sent us a note in reference to the heading of his last communication, in which he says: "In your last, No. 602, you head my letter 'on the subject of railroads with 'A Convert.' I do not, by any means, allow that I am a convert to the representations of the railroad projectors. All I thought it necessary to state was, that *hitherto* the Manchester and Liverpool Directors had paid both dividends and the interest of money borrowed."

Gas-lighting in France.—A correspondent is desirous of knowing from some of our French readers, how the cities of Marseilles and Lyons are lighted? And if by gas, what description of it?

Mr. Shire's paper has been overlooked; it shall be inserted soon.

We are again obliged to trespass on the indulgence of our subscribers with a double sheet, in order to keep pace with the industry of our many valuable correspondents and contributors. If we may judge, however, from such intimations as have reached us respecting these supplementary sheets, there is hardly any apology requisite; for though many have thanked us for them, we have not had a single complaint. Indeed, this is no more than we anticipated, from the care we have taken never to have recourse to an extra sheet, except when we had something to publish well worth the extra cost. The valuable essay which we give this week, from the pen of Mr. Rutter, on the Comparative Cost of Candle-light and Gas, would of itself be cheap at four times the entire cost of the Number.

Communications received from Libertus—B. S.—Mr. M'Curdy—Mr. Hann—A Constant Reader—Viator—Mr. Aldersey—Scrutator Mechanicus—Mr. White—P. P. C. R.

The Supplement to Vol. XXI., with a Portrait, on Steel, of the late Mr. Telford, continues on sale, Price 6*d.*; also the Volume complete, in boards, Price 8*s.*

☞ The Editor of the Mechanics' Magazine has made such arrangements as enable him to offer, on unusually advantageous terms, to undertake the solicitation of Patents for New Inventions, the drawing and revising of Specifications, and generally every other branch of Patent business. Drawings of Machines executed with accuracy and dispatch.

6, Peterborough-court, Jan. 3, 1835.

Errata.

In Mr. Fraser's letter, in our last Number, 7th and 12th lines from conclusion, for "cheek" read *check*.

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Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 604. SATURDAY, MARCH 7, 1835. Price 3*d*.

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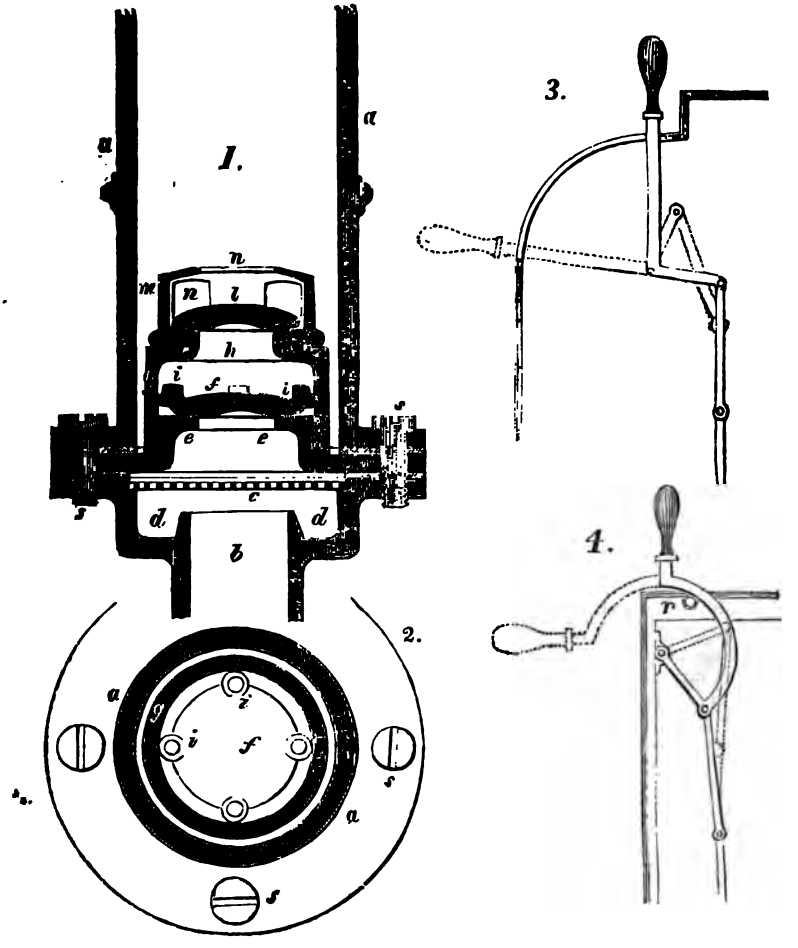


WARNE'S PATENT IMPROVEMENTS IN PUMPS.

Sir,—As the machine called a beer-engine is so well known in this metropolis, and has been for so many years in general use, a description of some important improvements upon it may not be unacceptable to your numerous readers.

The invention I am about to describe may be divided into two parts; one ensuring a more perfect and continuous working of the pumps, the other a more compact and efficient mode of applying power to them, than any hitherto known or practised.

The first may be adapted to the present beer-engine; by the second, the liquor may be drawn from the ordinary counter, and the separate beer-engine dispensed with.

I have this morning inspected a counter fitted on this principle, at Mr. Warne's, 113, Blackfriars-road, where any of your readers and the public may view it.

The common beer-engine has but one foot valve in each pump-barrel, and is subject to frequent stoppages, owing to particles of hops, &c., contained in the liquor, depositing upon the seat of the valve, by which the effective action of it is suspended, when it becomes necessary to employ a workman to put it in order again; the expense and delay to business from this defect, I am informed, is considerable.

The improvements in question consist in applying a more simple form of valve, and having two valves instead of one only—one immediately above the other, fitted to the barrel in a separate chamber, very ingeniously contrived, but of such plain construction as not to materially enhance the price of the pump. By the adoption of a second valve, the chance against stoppage in the action of the pump, is at least as two to one; but to render any stoppage (from floating or suspended matter getting into the barrel) still more improbable, a perforated screen is introduced between the surface of the liquor and the valves. The position in which I saw it, and which seems to be by far the best, is near the bottom of the chamber, just under the lowermost of the two valves, and below it is a fillet or ring of the same size as the suction-pipe, rising from the bottom of the chamber to within a little of the screen; the space between this ring and the interior circumference of the chamber, forms a receptacle for any matter rejected by the screen.

The second part of these improvements consists in the application of a circular instead of the straight lever, used in the common beer-engines: the one I saw was a quadrant, or nearly so; this lever pulls out of a mortice, little more in size than the transverse section of the lever, instead of requiring a circular chase for its action, as the ordinary lever does.

Although I have only described these improvements as adapted for the pumps used in public-houses, yet they are equally applicable to any other pumps.

Referring to the accompanying drawings, and the subjoined explanation of them, for further details,

I am, Sir,

Your obedient servant.

WM. VEBE.

January 22, 1835.

Explanation of the Engravings.

Fig. 1 is a vertical section; *a a* is the bottom part of a pump-barrel; *b* the top of suction-pipe; *c* the screen or grating to prevent solid matter of any considerable magnitude rising to the valves, and *d* the receptacle for such rejected matter; *e* the seat of the first valve; *f* answering to the ordinary foot valve; *g* a chamber encompassing and guiding this valve; *h* the passage for the liquor, when the valve *f* rises; *i i* studs upon the top of this valve, which strike against *k*, the seat of the second valve, and thereby prevent the valve from rising so high as to close the passage *h*; *l* the second valve, encompassed by the chamber *m*, out of which the liquor flows through the perforations *n n* into the pump-barrel.

Both the valves, *f* and *l*, are merely disks or buttons of metal accurately ground to their seats, and rising or falling freely within their respective chambers, and at the same time, provided they are both in working condition.

Fig. 2 is a horizontal section, taken below the seat *k*, fig. 1, to show the plan of the studs *i i* of the bottom valve *f*.

When a pump thus constructed gets out of order, the screws *s s* are with-

drawn, the suction-pipe *b* bent aside, and the chambers *g* and *m*, with their included valves, taken out, as also the screen *c*, for the purpose of cleansing, without removing the barrel from its place.

Fig 3 is a section of part of an ordinary beer-engine, and fig. 4 part of an ordinary counter; in each the external casing is shown shaded.

The full lines denote the position of the levers when the bucket is down, and the dotted ones when the bucket is up.

The circular part of the casing in fig. 3, not shaded, shows the chase through which the lever traverses; and it will be observed that the form of lever, shown at fig. 4, requires only a mortice-hole in the top of the counter for its motion. A friction roller *r*, fig. 4, may be used to advantage to take the bearing off the circular lever.

STEAM-BOAT MACHINERY.

Fig. 1.

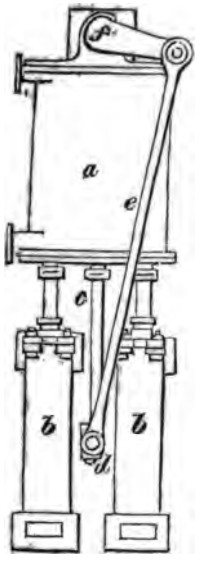
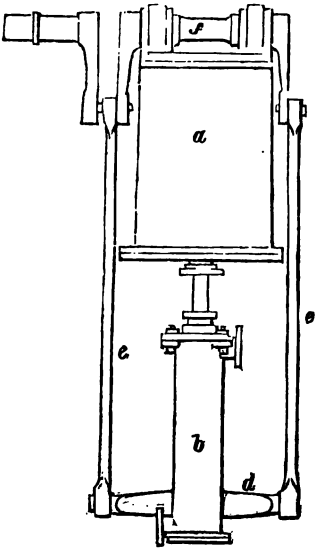


Fig. 2.

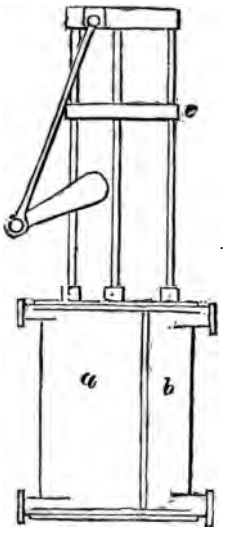


Sir,—In the side-view, fig. 1, and in the end elevation, fig. 2, another form of the steam-boat engine, described in No. 513 of the Mech. Mag., is shown.

a is the cylinder; *b* and *b* are two small air-pumps, wrought by means of rods fixed into the piston; and *c* is the piston-rod, which works through a stuffing-box in the bottom of the cylinder. The cross-head *d*, and the two side rods *e e*, communicate the motion of the piston to the crank-shaft *f*, placed above the cylinder. The stuffing-boxes for the two air-pumps are the same as the one described in No. 548 of your Magazine, and the stuffing-box for the piston-rod is constructed like the top part of the same stuffing-box. It is very easy to pack a rod for passing through a stuffing-box so constructed, as the cover has only to be drawn down the rod, and the packing put into it. The cross-head will

have more room to work, if snugs instead of flanches are cast on the ends of the air-pumps.

Fig. 3.



In fig. 3 a longer stroke is obtained than in the plan now described, and the engine is not so broad, as the ends of the cranks are always above the cylinder, and for this reason do not require a long shaft to let the cranks work past the sides of the cylinder. A length of shaft between the cranks, sufficient to give a good long journal, is all that is wanted.

a is the cylinder; *b* is the air-pump; and *c* is a stay for the rods. It would, perhaps, be better to have two air-pumps.

A very good and easy way of coupling two cranks together, by a pin fixed in one of them, is to have a flat side on the end of the pin, to bear against the crank that is to be joined to it. To hold the crank and the pin together, a bent bolt, with a nut on each end of it, is passed over the pin, and through an oblong hole in the side of the crank; when the nuts are screwed up the cranks are coupled.

I am, Sir, yours truly,

JAMES WHITELAW.

Glasgow, Jan. 1, 1835.

P. S.—If the air-pumps were placed at the ends of the cross-head, instead of under the cylinder, as in figs. 1 and 2, and the cross-head forked, so that two side rods, connected to a cross-head, fixed on the top of each air-pump, might be wrought off it, another very simple and compact form of a steam-boat engine would be obtained.

THE BRITISH MUSEUM AND THE PENNY MAGAZINE.

Sir,—Allow me, through the medium of your work, to make an inquiry of the public in general, whether there is any means of getting a sight of Sir Robert Smirke's plans and elevations for the new British Museum? The building is now proceeding under the authority of Parliament; about 200,000*l.* have already been expended on it; and it is said that a noble peer once declared in his place in the House, that the designs were the most magnificent ever conceived by the mind of man. It is rather uncommon, under such circumstances as these, that the public should be afforded no opportunity of ascertaining, before the building is finished (which, apparently, it will not be for the next ten years), whether its opinion is likely to coincide with that of the noble peer or no. I have searched the Reports of the House of Commons for information, and have there found none, but only such as to whet my appetite for more. In an estimate delivered in by Sir Robert (Reports of the House of Commons for 1824, vol. xvi.) it is stated, that the whole of the new buildings are intended to form a large quadrangle; but such of them as are up, hardly appear to be altogether suited to this view. I am curious to see how the huge brick reading-rooms, which are now seen peering over the offices on the left hand, on entering the court-yard of old Montague-house, will be made to agree with the main front. In this estimate, too, nothing is said of the plan of the north wing now erecting, and Sir Robert has furnished no other since then, that I can find. The subject is altogether one of very great interest, and one on which I suppose the public likes, no more than myself, to be left so completely in the

dark. Long before the National Gallery was begun, estimates and models of it were to be seen; but whether the front of the Museum will be Grecian or Gothic, low or high, beautiful or ugly, brick or stone, no Stationers' sheet Almanac, or other authentic record, has yet informed us.

I must add a word or two to say, that I bought the number of the Penny Magazine for February 14, with some eagerness, in the expectation, as the first plate is of the new Egyptian gallery in the Museum, of finding some of the information that I wanted. The column on this subject is a column full of emptiness: it consists almost wholly of sixtieth rate "fill-up" about the necessity of light from above to works of sculpture, except when light from the sides will do as well. The only solid fact that the writer ventures upon—that the new Egyptian gallery is about one-third of the size of the Elgin gallery—could not, one would think, have been written by any person who had ever seen the two. I am not aware of the exact dimensions—they seem to be just about the same. As to one being three times the size of the other, it might as well be said that Westminster-bridge was three times the length of Waterloo. The Penny Magazine is, I am sorry to say, seldom to be relied on in any of its statements. In this same article it talks of the paltry erection in which the Egyptian antiquities were formerly deposited, when every visiter of the Museum, of common memory, must recollect that they stood in an elegant hall, and that the paltry erection complained of must be that which contained the Elgin marbles. The "penny" writer displays, in fact, a marvellous lack of knowledge respecting our national Museum, on which countrymen and foreigners doubtless consider him an authority. About a month ago (in No. 183), he spoke of the library of All Souls' College at Oxford, as being, "perhaps," the largest room devoted to such a purpose in England, being 198 feet in length, &c. &c. &c. "Perhaps," indeed! Is this writer the only individual in London who is unaware that the new King's library in the Museum is 300 feet long and 40 broad? I might cite *plenty of other instances* of ignorance; but let me conclude with one other, and that shall be a laughable one. It is said in the Penny Magazine account of St. Paul's (No. 133), that the statue of Queen Anne, in the front yard, had its nose knocked off by a lunatic about a century ago, and that the said nose has never been replaced. Indeed, Mr. Knight! look again. From the windows of that office on Ludgate-hill, where you sell your 200,000 copies of the Penny Magazine to convey authentic information to all parts of the kingdom, you may very plainly see that her Majesty's nose is just where it ought to be—on her face—where it has now been for the last ten years, or thereabouts. So much for the authenticity of information collected "on the spot."

I remain, yours, &c.
P. P. C. R.

Feb. 20, 1835.

CARRIAGE-AXLES—COLLINGE'S AND BIRCH'S.

Sir,—Birch Rod rather mistakes my "subdued tone," as I did the probability of his being sick of the argument. He seems likely enough to abide by his opinions; and my fear is, that the sick ones are likely to be your readers, wherefore I will study all possible brevity in my reply to his last communication.

There is one definite size of axle-arm, which, for a given weight, is preferable to all others—longer, it would be too heavy; smaller, it would be too weak. This point, I conceive, Birch Rod will concede; we will therefore assume that size to be a cylinder of two inches in diameter.

If Birch's extra barrels be placed on this arm, the total diameter will be $2\frac{1}{5}$ inches; this is an increase of nearly a fifth. If the axle arm be reduced $\frac{1}{5}$ of an inch in diameter, so as not to increase the total diameter, it will be too weak. Birch Rod intimates that this is not "intended" to be done, therefore the disadvantage of extra bulk is proven, if his words be words of truth, and not special pleading. But he is mistaken if he supposes this the only disadvantage.

An axle-box, properly fitted to its arm, should have just so much lateral play or freedom from contact, as will allow the capillary passage of oil when in motion.

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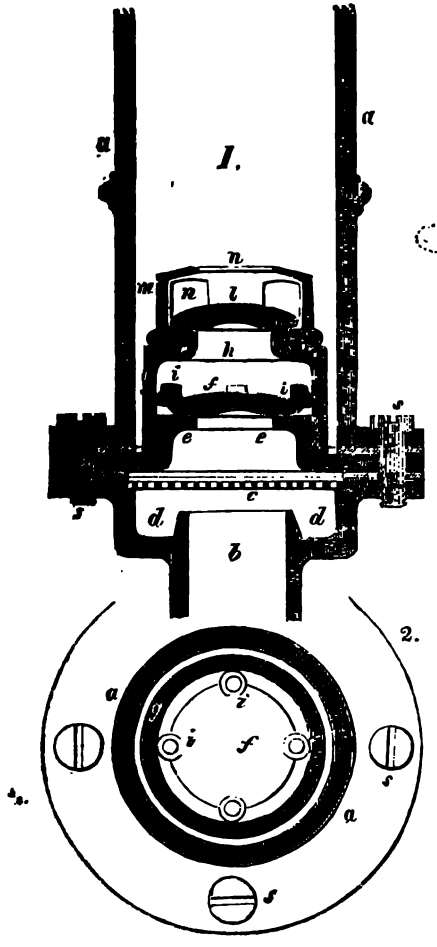

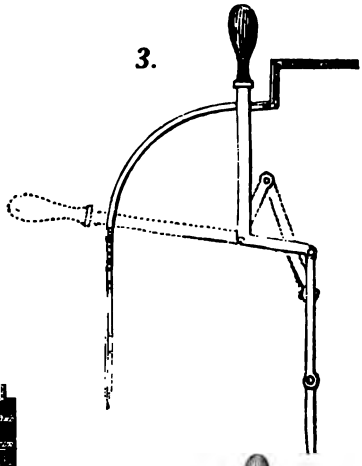

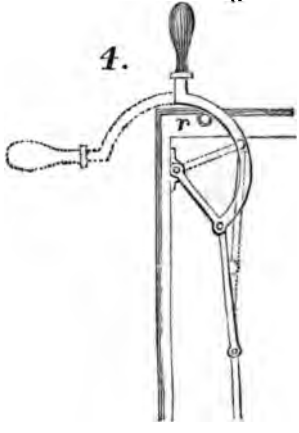

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The common beer-engine has but one foot valve in each pump-barrel, and is subject to frequent stoppages, owing to particles of hops, &c., contained in the liquor, depositing upon the seat of the valve, by which the effective action of it is suspended, when it becomes necessary to employ a workman to put it in order again; the expense and delay to business from this defect, I am informed, is considerable.

The improvements in question consist in applying a more simple form of valve, and having two valves instead of one only—one immediately above the other, fitted to the barrel in a separate chamber, very ingeniously contrived, but of such plain construction as not to materially enhance the price of the pump. By the adoption of a second valve, the chance against stoppage in the action of the pump, is at least as two to one; but to render any stoppage (from floating or suspended matter getting into the barrel) still more improbable, a perforated screen is introduced between the surface of the liquor and the valves. The position in which I saw it, and which seems to be by far the best, is near the bottom of the chamber, just under the lowermost *of the two valves*, and below it is a fillet *or ring of the* same size as the suction-pipe, rising from the bottom of the chamber to within a little of the screen; the space between this ring and the interior circumference of the chamber, forms a receptacle for any matter rejected by the screen.

The second part of these improvements consists in the application of a circular instead of the straight lever, used in the common beer-engines: the one I saw was a quadrant, or nearly so; this lever pulls out of a mortice, little more in size than the transverse section of the lever, instead of requiring a circular chase for its action, as the ordinary lever does.

Although I have only described these improvements as adapted for the pumps used in public-houses, yet they are equally applicable to any other pumps.

Referring to the accompanying drawings, and the subjoined explanation of them, for further details,

I am, Sir,

Your obedient servant.

WM. VERE.

January 22, 1835.

Explanation of the Engravings.

Fig. 1 is a vertical section; *a a* is the bottom part of a pump-barrel; *b* the top of suction-pipe; *c* the screen or grating to prevent solid matter of any considerable magnitude rising to the valves, and *d* the receptacle for such rejected matter; *e* the seat of the first valve; *f* answering to the ordinary foot valve; *g* a chamber encompassing and guiding this valve; *h* the passage for the liquor, when the valve *f* rises; *i i* studs upon the top of this valve, which strike against *k*, the seat of the second valve, and thereby prevent the valve from rising so high as to close the passage *h*; *l* the second valve, encompassed by the chamber *m*, out of which the liquor flows through the perforations *n n* into the pump-barrel.

Both the valves, *f* and *l*, are merely disks or buttons of metal accurately ground to their seats, and rising or falling freely within their respective chambers, and at the same time, provided they are both in working condition.

Fig. 2 is a horizontal section, taken below the seat *k*, fig. 1, to show the plan of the studs *i i* of the bottom valve *f*.

When a pump thus constructed gets out of order, the screws *s s* are with-

drawn, the suction-pipe *b* bent aside, and the chambers *g* and *m*, with their included valves, taken out, as also the screen *c*, for the purpose of cleansing, without removing the barrel from its place.

Fig 3 is a section of part of an ordinary beer-engine, and fig. 4 part of an ordinary counter; in each the external casing is shown shaded.

The full lines denote the position of the levers when the bucket is down, and the dotted ones when the bucket is up.

The circular part of the casing in fig. 3, not shaded, shows the chase through which the lever traverses; and it will be observed that the form of lever, shown at fig. 4, requires only a mortice-hole in the top of the counter for its motion. A friction roller *r*, fig. 4, may be used to advantage to take the bearing off the circular lever.

STEAM-BOAT MACHINERY.

Fig. 1.

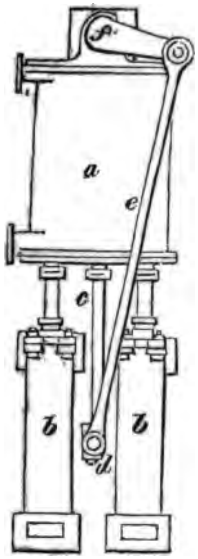
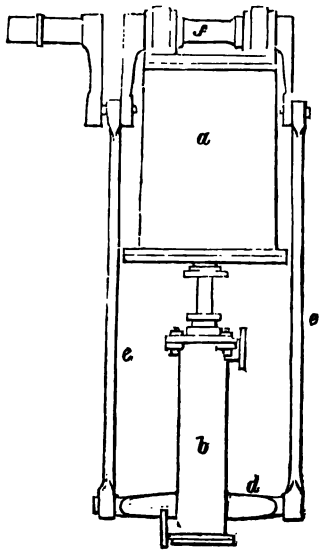


Fig. 2.

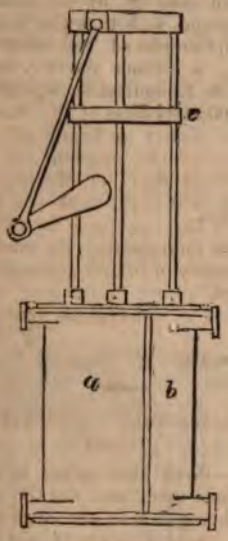


Sir,—In the side-view, fig. 1, and in the end elevation, fig. 2, another form of the steam-boat engine, described in No. 513 of the Mech. Mag., is shown.

a is the cylinder; *b* and *b* are two small air-pumps, wrought by means of rods fixed into the piston; and *c* is the piston-rod, which works through a stuffing-box in the bottom of the cylinder. The cross-head *d*, and the two side rods *e e*, communicate the motion of the piston to the crank-shaft *f*, placed above the cylinder. The stuffing-boxes for the two air-pumps are the same as the one described in No. 548 of your Magazine, and the stuffing-box for the piston-rod is constructed like the top part of the same stuffing-box. It is very easy to pack a rod for passing through a stuffing-box so constructed, as the cover has only to be drawn down the rod, and the packing put into it. The cross-head will

have more room to work, if snugs instead of flanches are cast on the ends of the air-pumps.

Fig. 3.



In fig. 3 a longer stroke is obtained than in the plan now described, and the engine is not so broad, as the ends of the cranks are always above the cylinder, and for this reason do not require a long shaft to let the cranks work past the sides of the cylinder. A length of shaft between the cranks, sufficient to give a good long journal, is all that is wanted.

a is the cylinder; *b* is the air-pump; and *c* is a stay for the rods. It would, perhaps, be better to have two air-pumps.

A very good and easy way of coupling two cranks together, by a pin fixed in one of them, is to have a flat side on the end of the pin, to bear against the crank that is to be joined to it. To hold the crank and the pin together, a bent bolt, with a nut on each end of it, is passed over the pin, and through an oblong hole in the side of the crank; when the nuts are screwed up the cranks are coupled.

I am, Sir, yours truly,

JAMES WHITELAW.

Glasgow, Jan. 1, 1835.

P. S.—If the air-pumps were placed at the ends of the cross-head, instead of under the cylinder, as in figs. 1 and 2, and the cross-head forked, so that two side rods, connected to a cross-head, fixed on the top of each air-pump, might be wrought off it, another very simple and compact form of a steam-boat engine would be obtained.

THE BRITISH MUSEUM AND THE PENNY MAGAZINE.

Sir,—Allow me, through the medium of your work, to make an inquiry of the public in general, whether there is any means of getting a sight of Sir Robert Smirke's plans and elevations for the new British Museum? The building is now proceeding under the authority of Parliament; about 200,000*l.* have already been expended on it; and it is said that a noble peer once declared in his place in the House, that the designs were the most magnificent ever conceived by the mind of man. It is rather uncommon, under such circumstances as these, that the public should be afforded no opportunity of ascertaining, before the building is finished (which, apparently, it will not be for the next ten years), whether its opinion is likely to coincide with that of the noble peer or no. I have searched the Reports of the House of Commons for information, and have there found none, but only such as to whet my appetite for more. In an estimate delivered in by Sir Robert (Reports of the House of Commons for 1824, vol. xvi.) it is stated, that the whole of the new buildings are intended to form a large quadrangle; but such of them as are up, hardly appear to be altogether suited to this view. I am curious to see how the huge brick reading-rooms, which are now seen peering over the offices on the left hand, on entering the court-yard of old Montague-house, will be made to agree with the main front. In this estimate, too, nothing is said of the plan of the north wing now erecting, and Sir Robert has furnished no other since then, that I can find. The subject is altogether one of very great interest, and one on which I suppose the public likes, no more than myself, to be left so completely in the

dark. Long before the National Gallery was begun, estimates and models of it were to be seen; but whether the front of the Museum will be Grecian or Gothic, low or high, beautiful or ugly, brick or stone, no Stationers' sheet Almanac, or other authentic record, has yet informed us.

I must add a word or two to say, that I bought the number of the Penny Magazine for February 14, with some eagerness, in the expectation, as the first plate is of the new Egyptian gallery in the Museum, of finding some of the information that I wanted. The column on this subject is a column full of emptiness: it consists almost wholly of sixtieth rate "fill-up" about the necessity of light from above to works of sculpture, except when light from the sides will do as well. The only solid fact that the writer ventures upon—that the new Egyptian gallery is about one-third of the size of the Elgin gallery—could not, one would think, have been written by any person who had ever seen the two. I am not aware of the exact dimensions—they seem to be just about the same. As to one being three times the size of the other, it might as well be said that Westminster-bridge was three times the length of Waterloo. The Penny Magazine is, I am sorry to say, seldom to be relied on in any of its statements. In this same article it talks of the paltry erection in which the Egyptian antiquities were formerly deposited, when every visiter of the Museum, of common memory, must recollect that they stood in an elegant hall, and that the paltry erection complained of must be that which contained the Elgin marbles. The "penny" writer displays, in fact, a marvellous lack of knowledge respecting our national Museum, on which countrymen and foreigners doubtless consider him an authority. About a month ago (in No. 183), he spoke of the library of All Souls' College at Oxford, as being, "perhaps," the largest room devoted to such a purpose in England, being 198 feet in length, &c. &c. &c. "Perhaps," indeed! Is this writer the only individual in London who is unaware that the new King's library in the Museum is 300 feet long and 40 broad? I might cite *plenty of other instances of* ignorance; but let me conclude with one other, and that shall be a laughable one. It is said in the Penny Magazine account of St. Paul's (No. 133), that the statue of Queen Anne, in the front yard, had its nose knocked off by a lunatic about a century ago, and that the said nose has never been replaced. Indeed, Mr. Knight! look again. From the windows of that office on Ludgate-hill, where you sell your 200,000 copies of the Penny Magazine to convey authentic information to all parts of the kingdom, you may very plainly see that her Majesty's nose is just where it ought to be—on her face—where it has now been for the last ten years, or thereabouts. So much for the authenticity of information collected "on the spot."

I remain, yours, &c.
P. P. C. R.

Feb. 20, 1835.

CARRIAGE-AXLES—COLLINGE'S AND BIRCH'S.

Sir,—Birch Rod rather mistakes my "subdued tone," as I did the probability of his being sick of the argument. He seems likely enough to abide by his opinions; and my fear is, that the sick ones are likely to be your readers, wherefore I will study all possible brevity in my reply to his last communication.

There is one definite size of axle-arm, which, for a given weight, is preferable to all others—longer, it would be too heavy; smaller, it would be too weak. This point, I conceive, Birch Rod will concede; we will therefore assume that size to be a cylinder of two inches in diameter.

If Birch's extra barrels be placed on this arm, the total diameter will be $2\frac{1}{7}$ inches; this is an increase of nearly a fifth. If the axle arm be reduced $\frac{1}{8}$ of an inch in diameter, so as not to increase the total diameter, it will be too weak. Birch Rod intimates that this is not "intended" to be done, therefore the disadvantage of extra bulk is proven, if his words be words of truth, and not special pleading. But he is mistaken if he supposes this the only disadvantage.

An axle-box, properly fitted to its arm, should have just so much lateral play or freedom from contact, as will allow the capillary passage of oil when in motion.

When the wheel is regulated, the same amount of end-play should be allowed for the same purpose. If a weight be applied sufficiently heavy to squeeze out the oil when in motion, the arm and box will both heat and swell, and then stick fast. If the oil be all used up, or be too thick to flow freely, the same process will take place. This is one of the two modes in which an axle-box becomes fixed on the arm. The other is by the casual interposition of particles of silex between the hardened surfaces.

Now, if a Collinge's axle be properly made, and properly loaded, so that the oil can have access to all parts of it when in motion, it will never heat or swell so long as any oil remains in it, and consequently will work well, and far more accurately than Birch's. If the oil be exhausted and motion kept up, it will stick fast, and so would Birch's; for when heat were elicited, the barrels would swell both ways. Stoppage from particles of silex, is a matter of sheer carelessness on the part of the person who oils the wheels. With ordinary care it cannot happen; and with a Birch's axle, though there is the solitary chance that one pair of surfaces only may take the silex, still the complication of the two loose barrels renders it still more liable to accident from carelessness than Collinge's.

In grinding Collinge's boxes on to the arms, it is not an uncommon thing to grind on two boxes before making a fit. This increases the expense considerably. What, then, must be the care required with Birch's, where the labour of grinding is more than doubled? What the price of the axles may be is not stated, but I should judge it to be considerable. Very accurate work, indeed, is required, and very accurate work must be highly paid for.

To make Collinge's axles run smoothly, a leathern washer is required at the shoulder, because motion or end-play must be allowed, to prevent friction, *i. e.* to admit the passage of the oil; and without the washer a clicking noise would ensue. If Birch's barrels are to move round freely, they also must have end-play. Have they a washer also, the same as the box? If not, they will be *noisy*.

"*Can Junius show* that the box acts *as a stay to the arm* against the shoulder, as effectually as the cylindrical barrels do?"

Certainly I can, and more so. Both barrel and box support the arm as a buttress supports a wall, and the degree of power depends on the breadth of the base. The box has a base $\frac{3}{4}$ inch all round, the barrels have $\frac{1}{16}$ inch. Moreover, the box is solid, the barrels are in two parts. Both have the same amount of end-play, and consequently the leverage, acting on the narrow-based barrel, is immensely greater than that on the broad based box.

"Junius must show that a circular rod of iron, or other material, will not break more readily when an incision is transversely made all round it, than if it were reduced the whole length to its diameter at the incision."

The central sinking on the surface of Collinge's axle-arm is not, as Birch Rod would imply, a mere incision, but from $1\frac{1}{4}$ inch to $1\frac{1}{2}$ inch in length. The total reduction of the arm at this spot is less than $\frac{1}{4}$ of an inch. But it is not necessary to have the arm reduced at all; a groove in the box will answer the purpose better. Birch's barrels, on the contrary, are in two parts, which is equivalent to an incision reducing the substance $\frac{3}{4}$ of an inch. This is precisely the "incision all round the schoolboy's stick," which he formerly alluded to, and it makes against himself. He can have the full benefit of it

Birch Rod objects to the double-coned wheel, if I understand him rightly. Will he doubt that a pyramid rests firmer on its base than a cube does? Would Jones's iron wheels be stronger if dished only one way?

There can be no doubt that good men and true are to be found in scientific societies; but I fear there are also a large number who care for nothing but the initial letters at the end of their names—men of the Panglos species.

It is painful to answer a writer, who is rather uncandid in the extreme, or utterly uncertain about his own meaning. At p. 268 he says:—

"Let me tell him further, that it is not necessary that the arm of Birch's axle should be of the same size as the arm of any other axle, because the barrels act as a stay to it, and gives the arm

nearly as much strength as if the whole were solid."

At p. 394 the same writer says:—

"Before those passages he quotes can appear contradictory, he must show that it is intended to reduce the arm with the barrels to a less diameter than that which the arm without them is at the incision."

The central incision, or turning down of Collinge's axle-arm, does not practically weaken it, because the point of breakage is at the shoulder. Birch's barrels do weaken the arm, because they reduce it at the shoulder where the strain lies, and the barrels are no help whatever to it.

To conclude: Birch's barrels are advantageous, inasmuch as they give an extra chance to the wheel against sticking fast, when, by carelessness or mismanagement, particles of silex are introduced between the rubbing surfaces of the axle and box.

They are disadvantageous.

Firstly. Because they increase the size of the box nearly one-fifth, or decrease the strength of the arm nearly one-fifth.

Secondly. Because their complicated construction renders them more liable to accident in the hands of awkward grooms, ostlers, and coachmen.

Thirdly. Because the complicated construction necessarily involves a considerable extra expense.

Fourthly. Because though a single axle may be got up truly and accurately, by bestowing much time and attention on it, as an article of common consumption the axles are more likely to be inaccurate than Collinge's are.

Fifthly. Because when inaccurate, as they probably would be in general, they would cause an unpleasant noise.

These disadvantages appertaining to the barrels, apart from the defects of the axle fastenings.

It seems to me, as I doubt not it has done to many of your readers, that the talents of Birch Rod are rather adapted to the general purposes of special pleading than to philosophical investigation, for the pure love of truth.

I remain, Sir,

Very truly yours,

JUNIUS REDIVIVUS.

February 20, 1835.

P. S. — Mr. Rosser has somewhat cleared up the obscurity of the *Morning Chronicle* on the subject of chimney building; but still there is a difficulty which I did not before thoroughly consider, when I relied on the agency of informers. How are the informers—I mean informers by profession—to get access to the chimneys to know any thing about them? Builders' workmen are insufficient, for trade prejudices are strong; and the honourable feeling prevalent amongst mechanics would make them abhor one of their number, who informed against an employer for his own private gain.

MESSRS. BUSK, KEENE AND CO.'S METHOD OF CONDENSING STEAM BY INTERNAL APPLICATION.

Sir,—We are obliged by your insertion in No. 602 of the Mech. Mag., of our letter of the 16th of February; but we must beg to observe that two errors occur in the printing, which we shall be further obliged to you to correct in your next, viz. the date of Mr. Hall's second patent should stand as of spring, 1833, and not 1830; and when we say that we execute orders for the application of external condensation, either with our own engines, or those of others, there should have been added, "and whether of high or low-pressure."

In reference to what you subjoin to our letter, we would state, first, that whenever Mr. Hall may think fit to bring his claims before a court of law, he will probably find that none of his specified matters are new or tenable; and secondly, as more especially touching his point of proportions, that we have from the first used, and still continue to use, whatever combined proportions of condensing water, condensing surface and dimensions of air-pump, we have thought, or may think, most expedient, according to the varying circumstances of each particular case.

We are, Sir,

Your obedient servants,

BUSK, KEENE & Co.

Bankside, Southwark, Feb. 24, 1835.

BAINES'S HISTORY OF THE COTTON MANUFACTURE.*

Every one who is acquainted with the "History of the County Palatine of Lancaster, by Edward Baines, Esq., M.P." —which is every one at least in the County Palatine—must be familiar with the valuable Historical Sketch of the Cotton Manufacture, contributed to that work by Mr. Edward Baines, jun.

Many persons of good literary judgment having recommended that this sketch should be detached from the work in which it appeared, and published separately, the author has not only complied with the suggestion, but availed himself of the opportunity afforded by this separate publication, to amplify it, by "additional materials," into a handsome volume of nearly three times the dimensions of the original sketch. He modestly expresses a hope that "the interest has not been diminished but increased by the enlargement." We can say, unfeignedly, for ourselves, that it has gained a great deal more in interest than it has in bulk; though but three times larger, it is at least ten times more instructive and entertaining. There are parts of the work that we think might be revised with advantage, and a few that we would utterly expunge, but not any entire page that we could wish away. Mr. Baines has had access to several valuable stores of information, which were not in existence when he wrote his original work; and he has made a free and good use of them.

"I have had the advantage of the evidence recently given before the Commission to inquire into the condition of children working in factories, and before the Select Committees of the House of Commons on manufactures, commerce, and shipping, and and on hand-loom weavers; by which much light is cast on the actual state of the cotton manufacture, and on the condition of all persons engaged in it. I have been favoured by the Factory Inspectors with a body of valuable statistical information, altogether original, showing the number of cotton mills in each county, town, &c., of England, Scotland, and Ireland, with the number of operatives engaged in them, and the amount of steam and water power by which the mills are moved."—Preface.

The most novel feature of the work, however, is the claim which it sets up, on the part of John Wyatt, of Birmingham, to the invention of spinning by machinery, hitherto so commonly ascribed to Sir Rich. Arkwright. "I have been fortunate enough," says Mr. Baines, in his Preface, "to meet with evidence as to the *real* authorship of the greatest inventions in cotton-spinning, never before published, and *as decisive as it is novel*." And, in the body of the work, he proceeds to marshal this evidence, in the same tone of perfect confidence, that it must infallibly overturn the prevailing belief on the subject. "The authorship of this splendid invention, like that of the art of printing, has been the subject of much doubt and controversy, and by far the greater number of writers have ascribed the honour to an individual who, though possessed of extraordinary talent and merit, was *certainly not the original inventor*. Sir Rich. Arkwright is generally believed, even to the present day, to have invented the mode of spinning by rollers. *I shall prove, by a piece of evidence the most unquestionable*, and which has never yet been published, that the invention was made, and was the subject of a patent, thirty years before it is pretended that Arkwright had conceived it. * * THE *inventor of the mode of spinning by rollers was* JOHN WYATT, *of Birmingham*." We have examined, with great attention, this new evidence, and all "unquestionable" as it is pronounced by Mr. Baines to be, we must take leave, not only to question most pointedly its validity, but to express our unaffected astonishment, that so judicious and careful a writer as Mr. Baines, should have founded so bold an award on so very slender a basis. We shall first lay before our readers the case which Mr. Baines has made out on Wyatt's behalf; and then submit our reasons for altogether dissenting from the view Mr. B. has taken of that person's claims.

After explaining in what the prodigious improvement effected by the pro-

* "History of the Cotton Manufacture in Great Britain; with a Notice of its Early History in the East, and in all the Quarters of the Globe; a Description of the Great Mechanical Inventions which have caused its unexampled extension in Britain; and a View of the Present State of the *Manufacture, and* the Condition of the Classes engaged *in its several* Departments. By Edw. Baines, *jun., Esq. Embellished* and Illustrated with Portraits of Inventors, Drawings of Machinery, &c. *Pp. 543.* 8vo. London, Fisher and Jackson.

cess of spinning by rollers consists, Mr. Baines goes on to say:—

"This is the invention ascribed to Sir Richard Arkwright, and on which his renown for mechanical genius mainly rests. It will be found, however, that the process had previously been described, with the utmost distinctness, in the specification of the machine *invented by John Wyatt*, and that cotton had for some years been spun by these machines. The patent for the invention was taken out in the year 1738, *in the name of Lewis Paul, a foreigner*, with whom Mr. Wyatt had connected himself in partnership, and *the name* of John Wyatt *only appears as a witness*; but there is other evidence to show that *the latter was really the inventor*. The reason why Paul was allowed to take out the patent can only be conjectured; it may have been that Wyatt was then in embarrassed circumstances."—p. 121.

Mr. Baines then gives an attested copy of Lewis Paul's specification, dated 20th Jan. 1738, in which he describes very literally (so much we may at once admit) the *principle* of spinning by rollers, and styles it "my invention." The material words are these:—

"The wooll or cotton being thus prepared, one end of the mass, rope, thread, or sliver, *is put betwixt a pair of rowlers*, cillinders, or cones, or some such movements, *which being twined in by their motion, draws in the raw mass of wool or cotton to be spun*, in proportion to the velocity given to such rowlers, cillinders, or cones. As the prepared mass passes regularly through or betwixt these rowlers, cillinders, or cones, *a succession of other rowlers, cillinders, or cones, moving proportionally faster than the first*, draw the *rope, thread, or sliver*, INTO ANY DEGREE OF FINENESS WHICH *may be required*."

The name of "John Wyatt" appears as one of the subscribing witnesses to this specification.

Mr. Baines's next step is "to show that the inventor was John Wyatt, and *not* Lewis Paul, in whose name the patent was taken out;" and his proofs are these:—

1. A letter *from Mr. Wyatt himself* to Sir Leicester Holt, in which he says, "I am the person that was *the principal agent in compileing the spinning engine*."

2. Two hanks of cotton yarn wrapped in a piece of paper, on which there is *the following memorandum*, in the *handwriting of Mr. Wyatt*:—

"The inclosed yarn, spun by the spinning-engine (without hands), about the year 1741. The movement was at that time turn'd by two (or more) asses walking round an axis, in a large warehouse near the well in the Upper Priory, in Birmingham.

"It ow'd the condition it was then in to *the superintendency of John Wyatt*.

"The above wrote June 3, 1756."

3. A manuscript book, said to have been "composed" by Mr. John Wyatt, entitled "A Systematic Essay on the Business of Spinning; or, the Manufacturing of Cotton Wool into Yarn for various uses, *without the intermediate application or intervention of the human fingers;* wrote in the year 1743, for the private purposes of its author;" from which book it is said to appear—

"That Wyatt resided principally in London in the years 1739 and 1740 (that is, at the time Lewis Paul's patent was taken out), during which time he was constantly inquiring about yarns; that he was at Birmingham in the beginning of 1741, observing the working of the manufactory (mentioned in the envelope of the two hanks of yarn spun in 1741), and that at that time Paul was one of its superintendents; that Wyatt left Birmingham again for London in March, 1741, but continued to take the interest of a principal in the concern; that at Michaelmas, 1743, the concern at Birmingham was at work, and Wyatt was endeavouring to dispose of their yarn, and to obtain cotton wool to spin, &c."—p. 126.

To that part of this extract in which the name of Paul is mentioned, there is the following not unimportant—note by Mr. Baines:—

"Some person, in whose hands the MS. book has been, *has taken the pains to cross out with ink the name of Mr. Paul*, in the only two places where it is mentioned; but by a close inspection the name may be deciphered."

4. A letter from Mr. Charles Wyatt, son of Mr. John Wyatt, which appeared in the Repertory of Arts for Jan., 1818, of which journal the writer's brother, Mr. J. Wyatt, was then editor, in which he claims the invention for his father, and gives the following history of its origin and subsequent fate:—

"In the year 1730, or thereabouts, living then at a village near Litchfield, our respected father first conceived the project, and prepared to carry it into effect, and, in the year 1733, by a model of about two feet square, in a small building near Sutton

Coldfield, without a single witness to the performance, was spun the first thread of cotton ever produced without the intervention of human fingers—he, the inventor, to use his own words, '*being all the time in a pleasing but trembling suspense.* The wool had been carded in the common way, and was passed between two cylinders, from whence the bobbins drew it by means of the twist. This successful experiment induced him to seek for a pecuniary connexion equal to the views that the project excited; and one appeared to present itself with a Mr. Lewis Paul, which terminated unhappily for the projection; for Paul, a foreigner, poor and enterprising, made offers and bargains which he never fulfilled; and *contrived, in the year* 1748, *to have a patent taken out in his own name*, for some additional apparatus, a copy of which I send you; and in 1741 or 1742, a mill, turned by two asses walking round an axis, was erected at Birmingham, and ten girls were employed in attending the work. Two hanks of the cotton then and there spun are now in my possession, accompanied with the inventor's own testimony of the performance. Drawings of the machinery were sent, or appear to have been sent, to Mr. Cave, for insertion in the "Gentleman's Magazine."* This establishment, unsupported by sufficient property, languished a short time and then expired; the supplies were exhausted, and the inventor much injured by the experiments; but his confidence in the scheme was unimpaired. The machinery was sold in 1743. A work upon a larger scale, on a stream of water, was established at Northampton, under the direction of a Mr. Yeaman, but with the property of Mr. Cave. The work contained 250 spindles, and employed fifty pair of hands. The inventor soon after examined the state of the undertaking, and found great deficiency and neglect in the management. At that time they had spun about 3,300 lbs. of cotton. On the observations which he then made, he composed what he entitled 'A Systematic View of the Business of Spinning,' which exhibits a clear view of the mechanical considerations on which an undertaking of that nature, of whatever magnitude, must be established, and apparently confines his humble pretensions to the profit on 300 spindles. It was not within human foresight to calculate the richness of the harvest to come from this little germ.

"This brings me to the conclusion of our father's connexion with the spinning business. The work at Northampton did not prosper. It passed, I believe, into the possession of a Mr. Yeo, a gentleman of the law *in London, about* the year 1764, and, from a *strange coincidence of circumstances, there is the highest probability that the machinery got into the hands of a person who, with the assistance of others knowing how to apply it with skill and judgment*, and to *supply what might be deficient, raised upon it, by a gradual succession of profit, an immense establishment and a princely fortune.*

* * * * *

"In 1748, Mr. Paul procured another patent, the title of which was for "carding of wool and cotton;" but whether this was combined with the machinery then at Northampton, or where it was introduced, I know not.*

"Such, or nearly such, being the early history of this invention, I thought the late Sir Rich. Arkwright would be gratified by possessing the very model† to which I have alluded, and I accordingly waited on him at Cromford with the offer, but my reception did not correspond with my expectations."

What the "strange coincidence of circumstances" was, to which allusion is made towards the close of the preceding extract, is not explained, either by Mr. Charles Wyatt himself, or by any one else. To the passage, where he says that he had sent his brother a copy of Paul's specification, Mr. Baines subjoins another—not unimportant—note:—

"The patent, though sent for publication, was not published in the 'Repertory;' and to this it is probably owing that Mr. Charles Wyatt's letter produced no effect on the public mind, being unaccompanied by the decisive proof contained in the patent itself."

5. Mr. Bolton, of Soho, Birmingham, the celebrated partner of James Watt, had "seen the spinning-machine at Birmingham when a boy, and assured Mr. Kennedy that he considered Wyatt as the inventor."

6, and lastly, Mr. Walter Hen. Wyatt, of Southwark, the grandson of Mr. John Wyatt, on being applied to by Mr. Baines for any further evidence the family might have concerning the invention, wrote as follows:—

"I am convinced of the fact of the invention being my grandfather's, from the evidence of the late Mr. Matthew Bolton, who, a short time previous to his death, called on me—the first and only time I ever

* *They* were not inserted.

* Mr. C. Wyatt omits to notice that Mr. Paul also took out a second patent as late as 1758, for an improvement in the process of spinning by rollers, which, like the first patent, was in *his own name.*

† This model is stated, at page 142, to have been since "lost or destroyed."

saw that gentleman—and in the course of conversation upbraided, or, I may rather say, condoled with me on the neglect of his sons, in claiming the invention."

Having thus settled—to his own satisfaction—that Wyatt, and not Paul, was the inventor of the machine, described in Paul's specification of 1739, Mr. Baines gives a description, illustrated by engravings, of the same machine as it was improved in 1758, when *Paul* (not Wyatt) took out his second specification, and then sums up as follows:—

"A comparison of this machine with that of Arkwright shows that there is a *great difference* in the construction of the two. So far is the one from being a copy of the other, that that of Arkwright indicates great inventive talents, even if we suppose that he had seen the former machine; but the mechanical details of the two *have so little in common*, that I am induced to think, contrary to the opinion of Mr. Charles Wyatt, that Arkwright had not seen the machine of Wyatt or Paul. It must, however, be admitted, that to contrive and adjust the details of such a machine, though of the greatest practical importance, is a merit very subordinate to that of him who conceived the great principle. THE LATTER IS THE GLORY OF WYATT."—p. 240.

Alas! for "THE GLORY OF WYATT," if it is to rest on the case which Mr. Baines has here made out for him! The case—such as it is—is clearly one, in favour, not of *John Wyatt*, but of *Lewis Paul*.

The person who in 1738 specified so exactly the principle of spinning by rollers was *Lewis Paul*, and one of the subscribing witnesses to this specification is the very "John Wyatt," who is now said to have been himself the inventor of the process.

The letters patent, too, in fulfilment of which that specification was inrolled, must have been granted upon oath, made by *Lewis Paul*, that he was "the first and true inventor" of the process, and that it had "never, to the best of his knowledge and belief, been before used by any other person or persons." When, moreover, twenty years afterwards, the second patent was to be taken out for an improvement in the same process, it was also in the name of *Lewis Paul*—not one word all the while of John Wyatt.

Nor was there any thing in the character of Paul to render it at all *unlikely that he should* be the actual and sole inventor — quite the contrary. There is evidence existing, altogether independent of the particular invention in dispute, to show that he was in truth a man of rare skill and ingenuity in mechanical matters. We need but quote what Mr. Baines himself has said of Paul in another part of his history:—

"The application of rotary motion was the grand improvement in carding; and this improvement, singular as it may seem, is traced back to Lewis Paul, the patentee of spinning by rollers. The carding patent of Lewis Paul, of the 30th of Aug., 1738, a copy of which, with the drawings, I have obtained from the Patent-office, includes two different machines for accomplishing the same purpose; the one a flat and the other a cylindrical arrangement of the cards. * * * * Here then are the carding cylinder, the perpetual carding, and the comb for stripping off the carding. It must be admitted that the invention was admirable and beautiful, though not perfect. Its defects were—that the cylinder had no feeder, the wool being put on by the hand—that the cardings were taken off separately by a moveable comb, which of course required the machine to stop—and that the perpetual carding was produced by joining short lengths with the hand, whereas now it is brought off the machine in a continuous roll, by a comb attached to the cylinder, and constantly worked against it by a crank. Paul's machine, though so great an improvement on the old method, was not known in Lancashire for twelve years, nor generally adopted for more than twenty years after the date of the patent. Thus the two most important and admirable inventions in cotton-spinning, the carding by cylinder, and spinning by rollers—which have also been adopted (with some modifications) in the manufactures of wool, worsted, flax, and tow, originated in the very same establishment, from twenty to thirty years earlier than is commonly supposed; and not in Lancashire, but in Warwickshire. As Paul's patent was obtained some years after Wyatt had retired from the concern, *the invention was probably his own.*"—pp. 172-174.

Mr. Baines, indeed, seems, from the expression at the close of this extract, which we have marked in italics, to be half-disposed to deny that Paul was absolutely the author of the invention of carding by cylinders—he thinks it was only "probably his own." But there is really not the smallest pretext for the doubt thus insinuated. The evidence of Paul's being

the inventor of cylinder carding is as perfect as evidence of title ever was; nobody has ever contested it—nobody can seriously contest it. Mr. Baines is reluctant to subscribe to it implicitly, simply because it does not suit the case he has got up in favour of Wyatt to the invention of spinning by rollers, that Paul should have been a person capable of producing so "admirable and beautiful" an invention as that of carding by rollers. His theory requires that Paul should be regarded merely as the monied person in the business, or, at least, as the person pretending to have money, while Wyatt was the person of mechanical genius—the "real inventor," whose "embarrassed circumstances" made it necessary that he should keep in the back ground, and allow the patent to be taken out in the name of Paul (121). But Mr. B.'s theory and the real facts of the case are sadly at variance. There is no evidence whatever of Paul's money or pretensions to money, but plenty of his being a person of mechanical genius; while, as regards Wyatt's qualifications in either way, the evidence is wholly silent. Wyatt is *supposed* to have been in embarrassed circumstances at the time of taking out the first patent; but that supposition proceeds on another which we are by no means prepared to admit—that his name *ought* to have appeared in the patent for spinning by rollers. He is *supposed*, too, to have been a person of mechanical genius; but that, again, depends on his having been the author of the invention in dispute, which is the very point, *sub judice*. Paul is shown to have been capable of producing the invention, by evidence quite independent of it; but as much cannot be said for Wyatt. When you have ascertained, past all dispute, that Paul was the individual who invented carding by cylinders, you are prepared to learn, without surprise, that he was also the inventor of the method of spinning by rollers; the one invention seems but a twin relation of the other. But there is no such probability—no probabilities, in fact, of any kind—to bespeak your belief in the claim set up for Wyatt; nothing beyond the claim itself. Let us sift then, a little, *the proofs* on which this claim rests.

1. *In the letter* from Wyatt to Sir *Leicester Holt*, he says, that he was "the *principal agent* in compileing the spinning-engine." "Principal *agent*" only, be it observed—*not* inventor; that is, principal workman or mechanic employed by the inventor and patentee Paul, in constructing or "compileing" the engine.

2. The memorandum on the paper, enclosing the two hanks of cotton yarn spun in 1741, states, that the engine by which they were spun "owed the condition it was then in to the *superintendency* of John Wyatt." Here, again, Wyatt makes no pretensions to the *invention* of the engine, but limits his claims in regard to it to the benefits conferred by his "*superintendency*."

3. The manuscript book, composed by Wyatt in 1743, professes to be "A Systematical Essay" on the "manufacturing of cotton-wool into yarn, for various uses, without the intermediate application or intervention of the human fingers," that is, of the spinning-engine; but it does not contain a single expression that can be construed into an assertion of the author's right to be considered as the *inventor* of the engine; at least no such expression is quoted from it, and we may be quite sure, that if there had been any thing of the kind, Mr. Baines, who appears to have had free access to it, would not have failed to bring it to light.

The name of Paul is, it seems, mentioned in this book "in two places;" but "some person, in whose hands this book has been, has taken the pains to cross out with ink the name of Mr. Paul" in both instances—not so completely, however, but that "by a close inspection, the name may be deciphered." Why this pains to suppress the name of *Paul?* Why this attempt to falsify John Wyatt's own history of the business? Let those who would exalt the memory of Wyatt, and obliterate that of Paul, explain. We wish Mr Baines had given the two passages in which Paul's name is mentioned, and trust he will see the fairness of supplying them in any future edition.

4. The history of the transaction, given by Charles Wyatt the son, carries it back to 1730, that is eight years earlier than the date of Paul's first patent. According to this version of the affair, "the first thread of cotton ever produced without the intervention of the human fingers," was spun by Wyatt the

father, at Sutton Coldfield, in 1733, by means of a model-machine which his son Charles had at one time in his possession, and offered to show to Sir Richard Arkwright. The first question which every one will be naturally disposed to ask here is, how does this story of Charles Wyatt's agree with the written statements of John Wyatt himself—with the "Systematical Essay" on the spinning-engine, in particular, which he left in manuscript? Is there any thing in any document, in John Wyatt's own hand-writing, about this Sutton Coldfield story? Since nothing of the kind has been cited by Mr. Baines, we think we are fairly entitled to conclude that nothing of the kind *can* be cited. We take it to be as good as admitted, that, in the book which John Wyatt himself wrote about the spinning-engine, there is not a word about the thread of cotton spun by him in 1733, or the model wherewith it was spun. The silence of John Wyatt might, possibly, be cured by other evidence; but *no other evidence is produced.* Charles Wyatt does not say how he came by the story, by whom it was told to him, or from what documents it was derived: he asks us to credit it on his *own unsupported testimony alone.* We dare say he believes the story himself to be all true; but before he can expect others to entertain the same belief, he ought to furnish us with his authorities for it, in order that we may satisfy ourselves that he has not been misled by some jumbling of dates, some confounding of transactions, or some overstepping of fair inference—all very possible cases.

Mr. Baines commends Charles Wyatt's letter as "characterised by a modesty and *candour* which do honour to the writer." Among the *proofs* of this "candour" which may be cited, is the way in which Charles Wyatt speaks of Paul. "Paul, a foreigner, poor and enterprising, made offers and bargains which he never fulfilled, and *contrived*, in the year 1738, to have a patent taken out in his own name for some *additional* apparatus." The *candour* here displayed strikes us as being of a sort, only to be matched by that which dictated the erasure of Paul's name from Wyatt the elder's history of the invention. The reader has seen that the specification of the patent, which Paul is accused of having "*contrived*" *to take out in his own* name—that is, stealthily and surreptitiously, to the prejudice of John Wyatt,—was witnessed by John Wyatt himself! We do not deem it worth while to insist that J. Wyatt must have known the contents of that specification—since it is just possible (though very improbable) that he was not made acquainted with them; but we must at least maintain, that the fact of Wyatt's being called to witness the deed, puts all idea of underhand contrivance with respect to it wholly out of the question. The patent, too, which exists to speak for itself, shows that it was not for any "*additional* apparatus," but for the *original* apparatus itself; and of this Mr. Charles Wyatt, with all his "candour," must have been perfectly aware.

Mr. Baines thinks that it was owing to the patent of 1738 not being published in the "Repertory," along with Charles Wyatt's letter, asserting his father's claim to the invention, that the latter "produced no effect on the public mind, being unaccompanied by the decisive proof contained in the patent itself." We marvel at his simplicity. The patent *did* contain "decisive proof"—not, however, that John Wyatt, but that Lewis Paul, was the author of the invention, and *therefore* it was that the editor of the "Repertory," more shrewdly than honestly, withheld it. The patent in favour of Paul was suppressed, for the same reason that it was attempted to erase the name of Paul from Wyatt the father's history of the invention—namely, that to do justice to Paul, is to annihilate the case set up for Wyatt. The letter of Charles Wyatt "produced no effect on the public mind" when published by itself—simply because, in itself, it was inconclusive and unsatisfactory; and now that it is published, accompanied by the patent, and by other documents, all of which are in flat contradiction to it, it must produce, we apprehend, still less effect than ever.

5, 6. The belief of Mr. Bolton, and the conviction of Mr. Walter Henry Wyatt, are, under the circumstances of the case, facts of no import whatever. Mr. Bolton may have been led to infer that Wyatt was the inventor, from seeing the spinning-engine at Birmingham under his "superintendency;" and Mr. W. H. Wyatt's conviction is no better than any other man's conviction.

To what, then, do all these proofs amount? To literally nothing. The

only affirmative evidence in favour of Wyatt's claim, is the Sutton Coldfield story told by his son Charles, and that, as we have seen, is good for nothing. For before we can give credit to this story (as Mr. Baines does), we must first believe that Lewis Paul committed perjury in swearing that he was the first and true inventor of the spinning-engine—that John Wyatt attested that perjury, in utter ignorance of what he was doing—that John Wyatt knew and believed himself to be the real inventor, though, in the written documents he has left on the subject—even those meant, as he says, for his own "private purposes"—he never makes any claim of the kind—that John Wyatt considered himself to have been tricked out of the invention by Paul, though he never at any time took any steps to vindicate, either to his friends or the public, his prior claim—and, to crown all, that a story derived we know not how, relating to circumstances not within the personal knowledge of the narrator, and authenticated by no sort of evidence whatever, is of more avail, as a piece of evidence, than all the direct and positive testimony, in writing and on oath, to which it is opposed—all which is so preposterous as to render any further comment unnecessary.

The merits of John Wyatt—apart from the claim set up for him (not *by* him) to the invention of the spinning-engine—appear to have been of no ordinary kind; and it is a pity that his family should have endangered the degree of credit which is his due, by asking so much more for him than he asked for himself. As the principal agent in "compileing" or constructing the engine, under Paul, the inventor and patentee, and as superintendent of it afterwards, he must have rendered services of the greatest importance—second only, perhaps, to those of the inventor himself.

But though "the glory" of first "conceiving the great principle" of spinning by machinery, must, assuredly be transferred from John Wyatt to Lewis Paul, we do not think that even Paul's incontestable claims would justify the tone of disparagement in which Mr. Baines speaks of the subsequent pretensions of *Sir Richard* Arkwright.

"*I will not,*" he says, "venture positively to assert that Arkwright derived the principle of his machine either from Wyatt or from High's, (another claimant, long ago disposed of, as the reader will find by reference to the Edinburgh Review, No. 91,) but I must declare my *strong conviction that this was the case.*" And on the strength of this mere conviction of his, or persuasion rather, for he admits that it falls short of the being able "positively to assert"—he treats Arkwright as, in point of fact, a most dishonourable appropriator of other men's inventions—whose conduct has "left a stain upon his character, which the acknowledged brilliance of his talents cannot efface." Strange treatment this. Of the "stain" Mr. Baines makes no doubt whatever, and yet, strange to say, he cannot "venture positively to assert" that Arkwright was guilty of that which can alone constitute the stain. We must be excused if we take quite an opposite course, and deny the stain until the offence be proved. With respect to the probability of Arkwright's having "derived the principle of his machine" from Wyatt—that is, from Paul—we see no ground for supposing any thing of the kind, beyond the "strange coincidence of circumstances" spoken of in Mr. Charles Wyatt's letter, as making it likely "that the machinery got into the hands of a person (meaning Sir Rich. Arkwright) who, with the assistance of others," "raised upon it, by a gradual accession of profit, an immense establishment and a princely fortune." Mr. Charles Wyatt has not, however, chosen to explain what this "strange coincidence of circumstances" was; and after what we have seen of his latetudinarian habits of assertion, we do not suppose that any person will be inclined to credit so pregnant an allegation, on his verbal authority alone. Mr. Baines thinks that the probability of Arkwright's having seen Paul's machine is "still further favoured by the repulse which he gave to Mr. Charles Wyatt, when the latter waited upon him with the original model of the spinning machine." We think the fair conclusion to be drawn from this circumstance is just the reverse. To repulse with indignation the person who offered to convince him that he had dishonourably appropriated to himself the invention of another—to put him at arms' length—to set him and his charge of piracy at defiance—was not the conduct of a guilty man, but of one strong in his own innocence, and

superior to all necessity of compromise. The instances of valuable inventions being lost, and after a lapse of time re-invented, are not so few or rare that we should infer dishonest appropriation from the mere circumstance of Arkwright's machine bearing a resemblance to Paul's. Between the date of Paul's invention, and the abortive attempts to carry it into practice at Birmingham, and the date of Arkwright's patent, there was time enough to allow the memory of the former to fall into oblivion—as regards all, at least but the learned and reading public, to which Arkwright was confessedly an utter stranger. The resemblance, moreover, extends only to the general principle of the two inventions; for even Mr. Baines allows that Arkwright could have derived but little assistance in the mechanical details, from any thing he might have seen produced by others.

"The difficulty, delay, and expense which attended the completing of the invention, prove, at the very least, that Arkwright did not receive it from any other a *perfect* machine. If he had seen either Wyatt's (Paul's) machine, or the model of that of High's, he had still to perfect the details; and the determined assiduity and confidence with which he devoted himself to this undertaking, before the machine had even been made to answer, shows that he had sufficient mechanical capacity to appreciate its value, and sufficient talent and energy to make the invention practicable and profitable."—p. 153, 154.

So widely, in fact, did Arkwright's machine differ in the details from Paul's —"so little in common" had they—that Mr. Baines is constrained to confess (after all) that he does not think "Arkwright had seen the machine of Wyatt or Paul." What, then, becomes of the charge of dishonest appropriation? What of the "stain"? Why should not Arkwright, who constructed his own machine, without help from any one, be supposed capable of also conceiving the "great principle" involved in it? What is there in the principle, that it should not have as readily come into the mind of Arkwright as into the mind of Paul? Does it lessen the probability of Arkwright's having found out the principle for himself, that he was able to produce a perfect machine *upon it*, while that of Paul's was so imperfect that every attempt to turn it to a profitable account failed? Arkwright was clearly the better mechanic of the two, and just as likely to have re-invented the entire machine as to have contrived any part of it.

We might extend this argument much further—did our limits permit—but we trust that we have said enough for the present to protect the character of this great benefactor of his country, from suffering in the public estimation from this new and very groundless attack upon it. We must return in a future Number to Mr. Baines's book, in order to do justice to the other and better portions of it; and, in the mean time, the worst that we are disposed to wish him is, a speedy sale of the present impression of his work, in order that he may have an early opportunity, in a second edition, of making that amends to the memories both of Arkwright and Paul, which we are convinced he will, upon a reconsideration of the whole circumstances of the case, see to be imperatively due.

NOTES AND NOTICES.

Inland Navigation.—The Erie Canal, lately opened between New York and Lake Erie, presents one of the most extraordinary instances on record of the beneficial effects of improving the internal communications of a country. It appears, from official documents published in the American papers, that the tonnage passed and repassed at one lock on this canal (Alexander's), west of Shenectady, during the seven months and a half of 1834, exceeded the entire tonnage, *both foreign and domestic*, of the port of New York for 1833, and this though New York is known to be one of the most thriving sea-ports in the whole world.

Driving Vessels under the Waves by Steam.—Mr. Morgan, in his evidence before the Committee of the House of Commons on steam-navigation to India, says, "Captain Austin, who commands the Medea, which is the largest war-steamer the Admiralty have, and who commanded the Salamander previously, having been in the Bay of Biscay in both of these vessels, has stated to me that in the one vessel, the Salamander, he could not stem the south-west gale; and that although in the other he could do it, still he found that he was obliged to ease his engines, *or they would have driven the vessel under the waves;* in the one instance having the power at command, he could not use it, and in the other instance, with a large nominal power (220 horses) he was forced to heave to."—A writer in the *Athenæum* observes, in confirmation of these remarks—"We had ourselves an opportunity of investigating what little is known of the loss of the Erin steamer in the British Channel, and we have reason to believe that she was worked under the waves by her own engines, in straining up against a tempestuous wind. The

Waterford steamer that passed her kept the wind a-beam, and frequently eased her engines, to which circumstance her escape was mainly attributable."

New Zealand Flax.—"The article in the Mech. Mag., 'on the strength of cordage' (vol. xxii. p. 250), leads me to inquire, what has become of the New Zealand Flax Company, established in London two or three years ago? About a year ago I called at their office in Bridge-street, Blackfriars, and saw several specimen-articles made of the *phormium tenax*, and was then and there told that the Company would shortly manufacture goods for sale; but I have been able to hear nothing more of them. What, too, has become of a rival establishment for the manufacture of ropes, twines, &c., from the same plant, but upon a different principle, set on foot by Captain Harris, R. N., at Grimsby, in Lincolnshire, where an extensive range of buildings was erected?"—Δικτυοποιητης, *Oxford*, Feb. 7.

The St. Helena Inclined Plane.—In No. 580 Mr. Woodhouse expressed a doubt as to the successful working of the St. Helena inclined plane, on the plan devised by Mr. Hoar. A correspondent, who has been very recently at St. Helena, informs us that he saw it when there "in full operation." He adds: "So far as I could learn upon the island, the only reward Mr. Hoar ever received was that of seeing his invention eagerly adopted by the East India Company's officers, and the inclined plane, which was previously quite useless, rendered completely available."

A Total Eclipse of the Sun took place in the latitude of South Carolina, on the 30th of November last. The eclipse commenced at 31 m. 49 sec. P. M., and terminated at 3 h. 20 m. 19 sec., for 1 m. 19 sec. of which time there was total darkness. Mr. R. T. Paine, an astronomer of Boston, who travelled nearly a thousand miles to witness this rare occurrence, gives the following description of some of the attendant phenomena, in a letter to Audubon, of rattlesnake celebrity, quoted in the *Nautical Magazine*:—"The effect produced on all animals was very great, whilst the unearthly appearance it produced on surrounding objects can never be forgotten. During the darkness, the buzzards and the poultry were seen flying to their places of roosting, and the plants of the mimosa tribe closed their leaves. When the sun was completely concealed from sight, the moon appeared to be surrounded by a beautiful effulgence. The following stars and planets were visible—Arcturus, Lyra, Altair, Antares, Venus, and Mercury. The thermometer fell six degrees during the time of the sun's obscuration."

Progress of Gas-Lighting.—Mr. John Webster, a man of very general and extensive information, in a work called "Elements of Chemistry," published in 1811, says, speaking of coal-gas, or carburetted hydrogen gas,—"It is true that much of the offensive smell may be taken away from the gas by passing it through lime-water; but the whole process is attended with much trouble, inconvenience and expense; and, notwithstanding the value of the tar and coke, the products of this operation, the generality of scientific persons seem to view it more as a matter of amusement, than as likely to be productive of public or private advantage." Yet, in the short space of twenty-four years, there is scarcely a petty town in the kingdom which is not lighted by this gas.—J. R. W.

Mr. Howard's Quicksilver or Vapour Engine has been for some time on trial on board of his Majesty's steam-vessel *Comet*, and its performances are very favourably spoken of.

Mr. Curtis, the eminent oculist and aurist, exhibited, *a few evenings since*, at the Royal Society, *a pair of convex* wire-gauze spectacles, of his invention, which are intended to be worn as a protection to the eyes against the wind, dust, sun, &c. They are periscopic, like those invented by Dr. Wollaston, are not expensive, and, as preservers, will be found preferable to glass, from not affecting the head. Many persons, after using glasses for a few hours, are troubled with headache, and even looking through the window of a carriage, when travelling, frequently produces the same effect.

Lord Brougham made a speech, the other day, at the Marylebone Literary and Scientific Institution, in the course of which he ascribed to his friend, Dr. Birkbeck, the merit of being "the Founder of the London Mechanics' Institution," which gave rise to so many institutions of a similar kind throughout England. His Lordship has said the same thing before—in pamphlets and reviews, as well as in speeches—but as often as he has said it, we have felt it to be our duty to enter our public protest against it, as decidedly untrue. We regret to be once more under the necessity of repeating this protest. It may suffice, by way of proof, on the present occasion, to state that Dr. Birkbeck himself, in his inaugural address, expressly disclaimed the merit of having founded the institution, and ascribed it to the proper parties. The obstinate perseverance of his Lordship in this historical error is the more remarkable, that he has not only been warned of it, again and again, but possesses such personal knowledge of the origin of the institution in question, as ought to have precluded the possibility of his offending so seriously against truth. We could perhaps explain to what this inveteracy of injustice is owing; but it is not for us, but his Lordship, to explain.

We shall endeavour to give Mr. Lamb's reply to Mr. Harvey in our next.

We shall send Col. Macerone's letter to H., and hope it may suffice, in the time, for the Colonel's vindication, to observe, that it contains a very spirited challenge to H. to meet him, "face to face, and point out *one*, at least, of the random false assertions" which H. says the Colonel is in the "habit of making."

Mr. Bowser shall hear from us soon.

Communications received from the Rev. T. Clark—Mr. Harvey—Mr. M. Noton—Omicron—Mr. W. F. Forester—B. S.

The Supplement to Vol. XXI., with a Portrait, on Steel, of the late Mr. Telford, continues on sale, Price 6*d.*; also the Volume complete, in boards, Price 8*s.*

☞ The Editor of the Mechanics' Magazine has made such arrangements as enable him to offer, on unusually advantageous terms, to undertake the solicitation of Patents for New Inventions, the drawing and revising of Specifications, and generally every other branch of Patent business. Drawings of Machines executed with accuracy and dispatch.

6, Peterborough-court, Jan. 3, 1835.

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Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 605. SATURDAY, MARCH 14. 1835. Price 3d.

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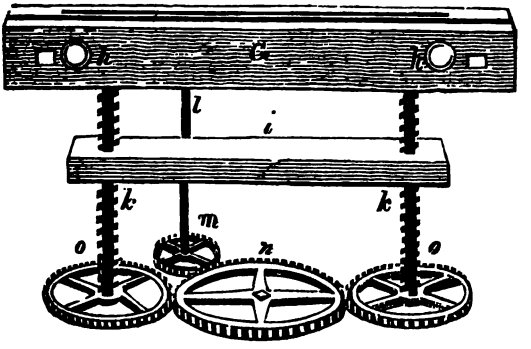

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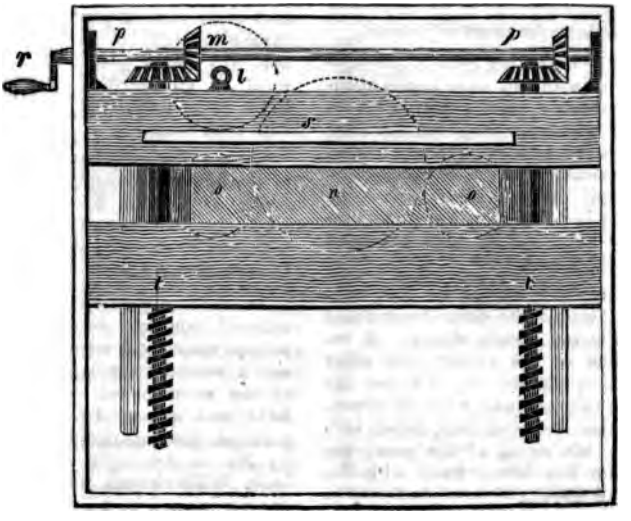

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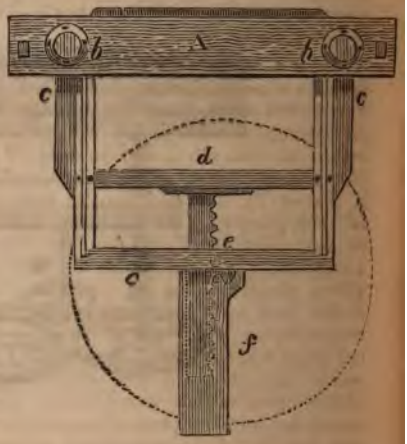

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I remain, Sir,

Yours respectfully,

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Sir,—In reply to an inquiry from one of your correspondents, I have extracted from the Company's Reports the following statement of the result of the quick-sailing passage-boats on the Lancaster Canal; together with a section of that part of the canal, from Bradshaw's Map of Canals, which contains valuable information on canal-locks and distances.

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Feb. 13, 1835.

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Waterford steamer that passed her kept the wind a-beam, and frequently eased her engines, to which circumstance her escape was mainly attributable."

New Zealand Flax.—"The article in the Mech. Mag., 'on the strength of cordage' (vol. xxii. p. 250), leads me to inquire, what has become of the New Zealand Flax Company, established in London two or three years ago? About a year ago I called at their office in Bridge-street, Blackfriars, and saw several specimen-articles made of the *phormium tenax*, and was then and there told that the Company would shortly manufacture goods for sale; but I have been able to hear nothing more of them. What, too, has become of a rival establishment for the manufacture of ropes, twines, &c., from the same plant, but upon a different principle, set on foot by Captain Harris, R. N., at Grimsby, in Lincolnshire, where an extensive range of buildings was erected?"—Δικτυποιητης, *Oxford*, Feb. 7.

The St. Helena Inclined Plane.—In No. 580 Mr. Woodhouse expressed a doubt as to the successful working of the St. Helena inclined plane, on the plan devised by Mr. Hoar. A correspondent, who has been very recently at St. Helena, informs us that he saw it when there "in full operation." He adds: "So far as I could learn upon the island, the only reward Mr. Hoar ever received was that of seeing his invention eagerly adopted by the East India Company's officers, and the inclined plane, which was previously quite useless, rendered completely available."

A Total Eclipse of the Sun took place in the latitude of South Carolina, on the 30th of November last. The eclipse commenced at 31 m. 49 sec. P.M., and terminated at 3 h. 20 m. 19 sec., for 1 m. 19 sec. of which time there was total darkness. Mr. R. T. Paine, an astronomer of Boston, who travelled nearly a thousand miles to witness this rare occurrence, gives the following description of some of the attendant phenomena, in a letter to Audubon, of rattlesnake celebrity, quoted in the *Nautical Magazine*:—"The effect produced on all animals was very great, whilst the unearthly appearance it produced on surrounding objects can never be forgotten. During the darkness, the buzzards and the poultry were seen flying to their places of roosting, and the plants of the mimosa tribe closed their leaves. When the sun was completely concealed from sight, the moon appeared to be surrounded by a beautiful effulgence. The following stars and planets were visible—Arcturus, Lyra, Altair, Antares, Venus, and Mercury. The thermometer fell six degrees during the time of the sun's obscuration."

Progress of Gas-Lighting.—Mr. John Webster, a man of very general and extensive information, in a work called "Elements of Chemistry," published in 1811, says, speaking of coal-gas, or carburetted hydrogen gas,—"It is true that much of the offensive smell may be taken away from the gas by passing it through lime-water; but the whole process is attended with much trouble, inconvenience and expense; and, notwithstanding the value of the tar and coke, the products of this operation, the generality of scientific persons seem to view it more as a matter of amusement, than as likely to be productive of public or private advantage." Yet, in the short space of twenty-four years, there is scarcely a petty town in the kingdom which is not lighted by this gas.—J. R. W.

Mr. Howard's Quicksilver or Vapour Engine has been for some time on trial on board of his Majesty's steam-vessel *Comet*, and its performances are very favourably spoken of.

Mr. Curtis, the eminent oculist and aurist, *exhibited, a few evenings since*, at the Royal Society, *a pair of convex* wire-gauze spectacles, of his invention, which are intended to be worn as a protection to the eyes against the wind, dust, sun, &c. They are periscopic, like those invented by Dr. Wollaston, are not expensive, and, as preservers, will be found preferable to glass, from not affecting the head. Many persons, after using glasses for a few hours, are troubled with headache, and even looking through the window of a carriage, when travelling, frequently produces the same effect.

Lord Brougham made a speech, the other day, at the Marylebone Literary and Scientific Institution, in the course of which he ascribed to his friend, Dr. Birkbeck, the merit of being "the Founder of the London Mechanics' Institution," which gave rise to so many institutions of a similar kind throughout England. His Lordship has said the same thing before—in pamphlets and reviews, as well as in speeches—but as often as he has said it, we have felt it to be our duty to enter our public protest against it, as decidedly untrue. We regret to be once more under the necessity of repeating this protest. It may suffice, by way of proof, on the present occasion, to state that Dr. Birkbeck himself, in his inaugural address, expressly disclaimed the merit of having founded the institution, and ascribed it to the proper parties. The obstinate perseverance of his Lordship in this historical error is the more remarkable, that he has not only been warned of it, again and again, but possesses such personal knowledge of the origin of the institution in question, as ought to have precluded the possibility of his offending so seriously against truth. We could perhaps explain to what this inveteracy of injustice is owing; but it is not for us, but his Lordship, to explain.

We shall endeavour to give Mr. Lamb's reply to Mr. Harvey in our next.

We shall send Col. Macerone's letter to H., and hope it may suffice, in the time, for the Colonel's vindication, to observe, that it contains a very spirited challenge to H. to meet him, "face to face, and point out *one*, at least, of the random false assertions" which H. says the Colonel is in the "habit of making."

Mr. Bowser shall hear from us soon.

Communications received from the Rev. T. Clark—Mr. Harvey—Mr. M. Noton—Omicron—Mr. W. F. Forester—B. S.

The Supplement to Vol. XXI., with a Portrait, on Steel, of the late Mr. Telford, continues on sale, Price 6*d.*; also the Volume complete, in boards, Price 8*s.*

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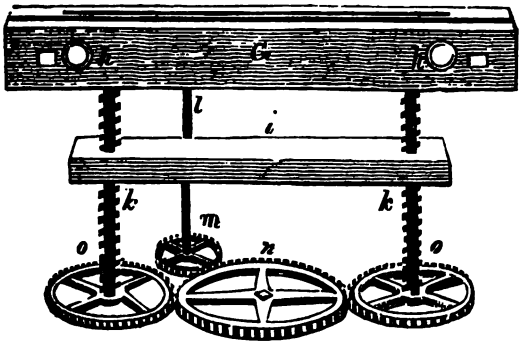

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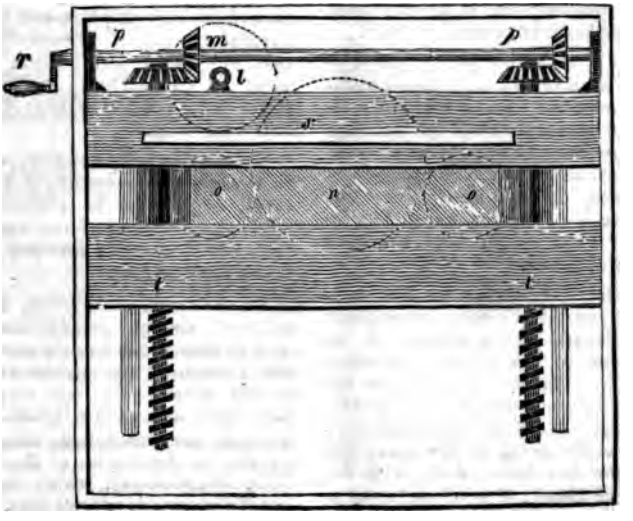

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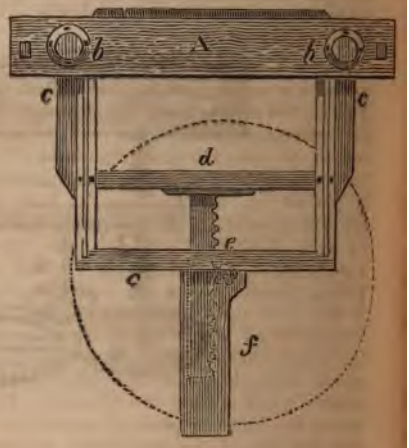

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2 B 2

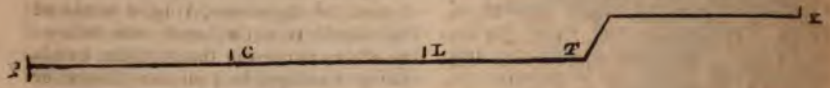
114 miles, and which has since been and is now continued. The distance from Kendal to Preston, fifty-seven miles, in which are a tunnel and eight locks, is performed in seven hours, including all stoppages. No difficulty is found in working the boat at nights; and during the winter, which has been extremely stormy, the time has been kept with great punctuality. The strongest proof that can be offered of the success of the boat is, that, from the 8th of July to the 31st of December, the number of passengers was nearly 16,000. Some inconvenience has arisen from having but one boat to perform so much work; but a second boat (the building of which has been unexpectedly delayed) will shortly be completed, and during next summer your Committee have it in contemplation to extend and improve the conveyance of working both boats. The outlay has been very considerable; but the receipts have been such as to warrant the expectation of an adequate return, and an increase to your revenue, as soon as the whole cost of the establishment has been paid off by its earnings."

"Lancaster, Feb. 4, 1834."

"The swift-sailing packet-boats continue to afford great satisfaction and accommodation to the public, and your Committee have every reason to congratulate the proprietors upon the result."

"Lancaster, Feb. 3, 1835."

Section of the Lancaster Canal between Preston and Kendal, 57 miles.



Explanations.

P. Preston; G. Garstang, 18 miles from Preston; L. Lancaster, 30; T. Tewitfield, 42 (after which there is 1 mile of lockage, rise 72 feet); K. Kendall, 57.

It will be observed, that of the 57 miles there are 56 on a dead level, without any lock or other interruption.

LONDON AND BIRMINGHAM RAILWAY.

Sir,—Having observed, in the Parliamentary notices for the present year, that the London and Birmingham Railway Company are applying for a bill to deviate and improve their former line, I am induced, through the medium of your valuable journal, to offer a few observations upon the subject, wishing to promote and facilitate the execution of this great national undertaking; but at the same time to prevent other companies, who are the directors of these great works, from falling into the errors which have accompanied this concern from its commencement—I mean in not having sufficiently explored and tried the country through which it is to pass, and obtaining in the first instance the best line possible.

It now appears that, after having *expended an enormous* sum of money in *making the survey*, instead of having *discovered the best* line, it turns out to be susceptible of great improvements, and the Company are consequently compelled to go to Parliament a second time, to change and alter the line in several places.

Taking a considerable interest in the prosperity of this great undertaking, as every well-wisher of his country must do, and having been engaged myself in the very first projection of this railway, I trust I shall be excused for intruding upon the public these few observations, and pointing out to the proprietors what I think, upon investigation, they would find a far better country than the one selected, and which there is yet time to adopt in some places with great advantage.

The line of country to which I allude was thoroughly explored and investigated in the year 1825 and 26, by the orders of the original committee, by my late brother, Mr. John Grantham, and my

self, under the direction of the Messrs. Rennies; and the result of the survey is most fully detailed in the Report and Sections of those gentlemen, dated April, 1826, deposited with their solicitor, Geo. Barker, Esq., of Birmingham. This line commences at the tunnel of the Regent's Canal at Islington, and skirting the Regent's-park to the Edgeware-road, to the east of Harrow, thence by Watford, and into the Valley above Cashiobury-park, by Two Waters to the summit at Tring, being nearly the same as adopted by the present line. From this summit, instead of taking the low grounds by the Leighton Buzzard Valley, and following the circuitous course of the Old Canal, it descends to near Wingrave, about three miles north of Aylesbury, crossing the Thame river near Whitefields to Quainton by Nole-hill, and over the high grounds of Shelnwell to Mixborough; thence south of Brackley, and by Middleton Chenny to the Oxford tunnel near Fenny Compton, and pursuing the course of the Watergall river, crosses the Warwick and Knapton Canal near Bascote; from thence over the river Leame to near Baggington, where it crosses the Sow to Canby south of Coventry; thence to Barston, and Kittlebarn Heath to Kingsford, where it crosses the Birmingham and Warwick Canal, and by Acock's Green, Sparksbrook, and over the river Rea to Birmingham.

The distance of the above line, in comparison with the present, is 116 miles; and its advantages are, that there is no tunnel, except one of a quarter of a mile, under the high grounds at Paddington; that the generality of the inclinations do not exceed from 4 to 14 feet to the mile, with the exception of one or two instances of 16 feet to the mile; that the general quantity of cutting and embanking is remarkably small, and not exceeding in height from 30 feet to 45 feet; that the great bulk of it consists of little more than surface forming; that no parks or pleasure-grounds are interfered with; and that, for the most part, it goes through a country unoccupied by any good communication either by canal or road; so that the total expense was not anticipated to exceed from ten to twelve thousand pounds a mile: whereas, the present Birmingham line, *although it is only* 112 miles long, has no less than eleven tunnels, averaging from a half to one and a half miles long each; the levels for the most part are 17 feet to the mile; the turnings are exceedingly sharp, and in one or two instances actually occur in the tunnels themselves, which certainly is of all places the worst: it consists, moreover, of nothing but a series of heavy cutting, tunneling, and embanking, from one end to the other, averaging from 30 to 60 feet for two miles at a stretch, running parallel with and crossing and re-crossing the Grand Junction and other canals in all directions; and all this at an expense of 23,000*l.* per mile.

Such being the case, Mr. Editor, I merely put it to your readers whether, for the sake of the science of the day, or the benefit of the undertaking, it would not be better to pause, and endeavour, if possible, to correct the existing line, as far as it can yet be judiciously done, before it is too late. As I have observed before, the line which my brother and myself surveyed was not intended to exceed from 10 to 12,000*l.* a mile, and consequently was the cause of its being something longer in distance —having in some instances gone aside to avoid expensive cuttings; but now that the proprietors are prepared to pay 23,000*l.* a mile, for a much worse line, this might be reduced to even a less distance than their present line, with only two or three tunnels, and the estimate reduced one-third.

I hope I shall be excused for having thus brought the attention of the numerous readers of your valuable journal to this important public work, having no other object in view than to place the true merits of the case before the public, which I do with the greatest confidence, leaving the means of proving the above statement by actual surveys taken in the fields—taking, not theoretical, but practical knowledge for my guide. I have such a dread that the enormous expense of the present line will completely cripple this noble undertaking, that I would make any sacrifice to see it prosperous and successful. I have no party motives for my interference—no wish but for the ultimate welfare of the concern; and if what I have here said should induce the present Company, instead of going to Parliament only for a partial benefit, to

THE THAMES TUNNEL.

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20,000*l.*), the public were assured
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l. could be raised, "every finan-
tacle, in regard to the completion
Tunnel, would be overcome."
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the Directors said that 100,000*l.*
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hem, and accordingly, though
exertion was made to raise that
way of loan, on a mortgage of
ire concern, not more than bid-
or a thousand or two could be ob-

The Directors then proposed to
the sum to be borrowed; but still
blic were incredulous, and refused
ribe. The public, it is now clear,
rightly. We presume that when
rs agreed to advance the 247,000*l.*,
on some sort of evidence satisfac-
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sufficient to complete the Tunnel,
en it for public traffic. But, for
n parts, we must confess that we
ry great misgivings. We think,
it could have been made out to
he satisfaction, that that sum will
cient, and that there is a prospect
nue enough from the tolls to pay a
ore than the ordinary rate of in-
there would have been no occa-
r the Government to come for-
the money would have been ad-
by individuals. Neither can we
le ourselves that that can be a
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because it is, in the unanimous judg-
ment of the public, a bad pecuniary spe-
culation. Even when it was estimated
that the whole cost would not exceed
250,000*l.*, it was not supposed that the
tolls would pay more than 4 per cent. on
that sum; so that, should the 247,000*l.*
now advanced by Government for its
completion, be found sufficient for the
purpose, there will be just revenue
enough to pay the interest on that loan,
and not one shilling for the unfortunate
shareholders. But what if 247,000*l.*
should not be enough—if 100,000*l.*, or
200,000*l*, more should be required? In-
stead of 4 per cent., the Government will
then scarcely get 2 per cent. on their
loan, and all hope of the shareholders
ever getting a single farthing must be
for ever at an end. Now, that *more* than
247,000*l.* will be required, we think
likely, for these reasons,—1st, That when
the engineer stuck in his task he had but
got to the worst part of it—the middle;
and 2d, That when the Tunnel is finished,
there must be approaches made to it on
both sides, for which no provision what-
ever has yet been made. Our firm per-
suasion is, that before all is done, the
cost will not fall short of a million. It
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late, not the *present* administration.
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privately a large shareholder in the con-
cern, uniformly refused to sanction any
thing of the kind. With Lord Althorp
the Directors were more successful; they
managed to persuade him that it con-
cerned the honour of the country (God
save the mark!) that the work should be
completed; and so it has come to pass,
that a regard for an empty name (in this
case at least) has effected what a sober
pounds, shillings, and pence calculation
would never have done. Well—John
Bull will yet be able to boast (perhaps)
of a *greater bore* than Jean Crapaud,
Brother Jonathan, or any other gentle-
man of modern times; but we beg, with
great respect to John, to submit, whether
it will not, after all, be *paying too dear
for the whistle*.

take the bull by the horns, and boldly commence an entire new line from the Tring summit to near Coventry, by the course I have pointed out, I am sure they would be amply rewarded for their pains, and this great work would be made an example and an excitement to future undertakings of the same nature, while its failure to any considerable extent would infallibly damp the spirit that is now abroad for pursuing one of the most useful, safe, and expeditious methods of locomotion ever introduced for the benefit of society, trade, and commerce.

I am, Sir,

Your obedient servant,

EDW. GRANTHAM,

Civil Engineer, Croydon, Surrey.

MR. GURNEY'S "PERFECT" STEAM-CARRIAGE.

Sir,—Your correspondent H., in a recent Number, has some shrewd observations on the statements of Mr. Gurney, in regard to the receipts and expenditure of his steam-carriages during the period they were run by Sir Charles Dance on the Gloucester and Cheltenham-road. I agree with him that those statements, taken in conjunction with the well-known facts *suppressed* by Mr. Gurney, but which have been publicly stated in your Journal and elsewhere, and not contradicted, instead of demonstrating the superiority of steam-carriage conveyance over horse-coaches, prove directly the reverse. I concur with him also in holding, that if Mr. Gurney's dictum were correct, that "*his carriage was then in a* PERFECT *state,*" the sooner steam-locomotion on turnpikes is abandoned the better.

It has always struck me, that these and other arrogant observations of Mr. Gurney have thrown discredit and ridicule on the whole of his evidence, and tended materially to bring into disrepute the general cause of steam-locomotion on common roads. Every person acquainted with the construction of his carriages, knows that they were then, and still are, *most* IMPERFECT in principle and details; and a little consideration *will satisfy* any one that it was *owing to that imperfection* alone that *the proof of economy*, so much desiderated, was so lamentably wanting in that instance, and the deficiency so fully manifested afterwards by the trips on the Greenwich road, where a degree of encouragement was extended to these very carriages by the public, which gave them much more than a fair trial, and would have established their superior advantages over horse-coaches most satisfactorily, had they not completely exhausted their powers during the six or eight days of their travelling on that road, and at the end of that period died a natural death.

If these carriages had been "perfect," as Mr. Gurney pretends, that is to say, capable of doing the regular work of horses, without injury to the boiler, or disorganisation to the machinery, assuredly it would require no great stretch of reasoning to prove that such an establishment was capable of being conducted upon a much more moderate scale of expense than any establishment of horses; but, until that is done, it must be admitted that the economical problem has not been solved. It humbly appears to me, that until Mr. Gurney abandons his tubular boiler, with or without his much-vaunted separator, and adopts one which will afford him a continuous supply of steam, without injury to the metal from the action of the fire—until he lightens, attenuates, and adjusts, with greater precision, the proportions of the various parts of his machinery—until he does away with that never-ceasing source of accident, crank-axles—until he connects his boiler more immediately with his cylinders, and suspends the whole of his apparatus by springs of such a description as will save it from the jolts and concussions of bad pavement and rough roads—until he alters and improves his carriage in these and a great many more particulars, the tear and wear, the daily and hourly havoc and destruction to which his machinery is exposed must entirely unfit his carriages for the business of the road, and cannot fail to prevent all reasonable persons from embarking in any undertakings connected with them, or with any other steam-carriages, constructed upon similar principles.

I am, &c.

VÉRAX.

Harrow, Feb. 23, 1835.

THE THAMES TUNNEL.

The Directors of this undertaking have succeeded in obtaining a loan from Government of 247,000*l.*, for the purpose of completing it (the entire sum has actually been handed over to them in Exchequer bills!). When the work was stopped about half-way, seven years ago, through the exhaustion of the 250,000*l*, for which Mr. Brunel promised *the whole* should be executed (nor let the irruptions of the river be offered as an apology for the engineer's miscalculation, for they did not cost altogether 20,000*l.*), the public were assured by the Directors, that if but an additional 100,000*l.* could be raised, "every financial obstacle, in regard to the completion of the Tunnel, would be overcome." Not the slightest change has taken place in the state of the works since that time, and yet, instead of 100,000*l.*, we see that 247,000*l.* is now required to complete it! When the Directors said that 100,000*l.* would suffice, the public would not believe them, and accordingly, though every exertion was made to raise that sum by way of loan, on a mortgage of the entire concern, not more than biddings for a thousand or two could be obtained. The Directors then proposed to double the sum to be borrowed; but still the public were incredulous, and refused to subscribe. The public, it is now clear, judged rightly. We presume that when Ministers agreed to advance the 247,000*l.*, it was on some sort of evidence satisfactory to themselves, that this sum at least will be sufficient to complete the Tunnel, and open it for public traffic. But, for our own parts, we must confess that we have very great misgivings. We think, that if it could have been made out to *the public satisfaction*, that that sum will be sufficient, and that there is a prospect of revenue enough from the tolls to pay a little more than the ordinary rate of interest, there would have been no occasion for the Government to come forward; the money would have been advanced by individuals. Neither can we persuade ourselves that that can be a safe loan for the public to make in its aggregate capacity, which not one of that public will, as an individual, have any thing to do with. The Thames Tunnel has not remained so long uncompleted *from any luck of disposable capital in the country* (*the notion* is absurd), but because it is, in the unanimous judgment of the public, a bad pecuniary speculation. Even when it was estimated that the whole cost would not exceed 250,000*l.*, it was not supposed that the tolls would pay more than 4 per cent. on that sum; so that, should the 247,000*l.* now advanced by Government for its completion, be found sufficient for the purpose, there will be just revenue enough to pay the interest on that loan, and not one shilling for the unfortunate shareholders. But what if 247,000*l.* should not be enough—if 100,000*l.*, or 200,000*l*, more should be required? Instead of 4 per cent., the Government will then scarcely get 2 per cent. on their loan, and all hope of the shareholders ever getting a single farthing must be for ever at an end. Now, that *more* than 247,000*l.* will be required, we think likely, for these reasons,—1st, That when the engineer stuck in his task he had but got to the worst part of it—the middle; and 2d, That when the Tunnel is finished, there must be approaches made to it on both sides, for which no provision whatever has yet been made. Our firm persuasion is, that before all is done, the cost will not fall short of a million. It is but right, however, to add, that the loan of 247,000*l.* was obtained from the *late*, not the *present* administration. When the Duke of Wellington was formerly in power, the Directors of the Tunnel made great exertions to obtain such a loan, as they have now procured, from the Public Treasury; but his Grace, much to his credit, though privately a large shareholder in the concern, uniformly refused to sanction any thing of the kind. With Lord Althorp the Directors were more successful; they managed to persuade him that it concerned the honour of the country (God save the mark!) that the work should be completed; and so it has come to pass, that a regard for an empty name (in this case at least) has effected what a sober pounds, shillings, and pence calculation would never have done. Well—John Bull will yet be able to boast (perhaps) of a *greater bore* than Jean Crapaud, Brother Jonathan, or any other gentleman of modern times; but we beg, with great respect to John, to submit, whether it will not, after all, be *paying too dear for the whistle*.

(From the American Railroad Journal.)

Statement of the number of passengers conveyed on the South Carolina Railroad, the number of bales of cotton brought down on it, with the amount received from freight and passage, for the six months ending October 31, 1834.

	No. of bales of Cotton.	Amount of Freight.	Passengers.		Total Amount received.
			No.	Amount.	
May	3,103	8,545 63	3,401	10,363 72	18,909 35
June	1,679	5,624 20	2,672	6,783 06	12,407 86
July	655	3,581 35	2,556	5,164 65	8,746 01
August	1,161	5,304 01	1,652	3,624 08	8,928 09
September	1,844	10,411 79	1,138	3,044 52	13,456 31
October	4,314	13,837 99	2,156	7,159 81	20,997 80
	12,756	47,304 97	13,575	36,140 45	83,445 42

Statement showing the Current Expenses of the Road from 1st *May to* 31st *October*, 1834.

Expended in *Cash*, on the current charges against the business done, say in wages, repairs, &c.		43,061 11
Amount of debt due 31st October, 1834, as per ac't c't	275,707 58	
Amount of debt due 1st May, as per ac't	168,715 26	
Increase of debt from 1st May to 31st October	106,992 32	
Increase of machinery and other property shown by excess of amount of inventory of 31st October over that of 1st May, 1834	92,475 82	
Construction of road from Ln. to Depos.	4,000 00	
Embankment	6,000 00	
	102,475 82	
Showing the difference which has also been expended in current charges against the road..		4,516 50
Add amount of salaries, P. Rolls, &c., for month of October		9,926 06
Making a total of current expenses		57,503 67
Excess of receipts over current expenses from 1st May to 31st October, 1834		25,941 75
Receipts of Road from 1st May to 31st October, 1834		83,445 42

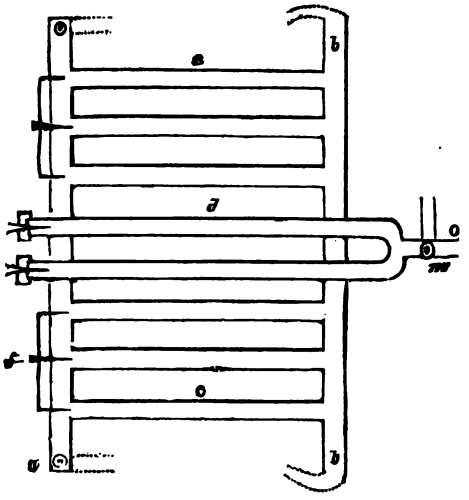
We extract from the same excellent American Journal, to which we are indebted for the preceding document, the following additional particulars. The South Carolina Railroad is to extend from Charleston to Hamburg, situate on the Savannah, a distance of 135½ miles, of which 65 miles have been already completed, or, to speak more properly, brought into a temporary working state only, for of the 65 miles "surface construction," it is stated that there are but 27 miles "filled up level with the rails." There are twelve locomotives employed on the line, which are named, and have been manufactured, as follows:—

The Edgefield, by R. Stephenson and Co., of Newcastle.
The Augusta, by E. Bury, of Liverpool.
The Georgia, do. do.
The Columbia, by Fenton and Co. of Leeds.
The E. L. Miller, by M. Baldwin, of Philadelphia.
The Horry, by contract with E. L. Miller, of New York.
The Aiken, by contract with E. L. Miller, of New York.
The Native, by Eason & Dotterer, of Charleston.
The Hamburg, by the West Point Association.
The Edisto, by the West Point Association.
The Phœnix, rebuilt from Company's own workshop.
The Constitution, do.

Mr. H. Allen, the chief engineer, states that the principal accidents on this railway have arisen from the breakage of axles. "It is probable," he says, "that the use of high cars and elevated loads of cotton, have occasioned the breaking of the same sized axles that have *previously, with the low* cars, been found adequately strong. Measures were taken, some *time since, to guard* against such breakage, by reducing the loads carried by the present cars, *and having all the* new axles made of larger dimensions."

IMPROVEMENT IN THE FIRE-BARS OF LOCOMOTIVE-ENGINES.

Sir,—The Rev. Dr. Lardner, in his evidence given before the Select Committee (p. 317, No. 597 of your Magazine), says, "that he has witnessed a new set of grate-bars melted in a single trip between Manchester and Liverpool." From this I conclude, that the fire-bars of locomotive-engines are generally red-hot; and supposing this conclusion to be correct, it strikes me that the red-hot bars may be rendered of use to the engine—first, by increasing the energy of the fire, should the steam flag on the ascent of long hills, or in going over heavy roads; and, second, by producing a brilliant light, when locomotives undertake night journeys. Both these objects I propose to effect, by using hollow fire-bars, and making them serve as so many small oil-gas retorts; or, at other times permitting the air to pass through them to the furnace.



Suppose the front bar *a*, and back bar of the grate *b*, hollow, and of larger dimensions than the hollow fire-bars *c c c*, all which open into them, except the two centre bars *d d*, which pass through both. In the front bar *a*, just opposite each fire-bar, are entered jet-points *f*, connected with a small forcing-pump, with which the attendant may alternately inject oil into the bars on the right and left of the centre; which oil being converted into gas will pass into the bar *b*, from each end of which a pipe should pass upwards to the side or front of the furnace, as the form of the boiler may render most advisable. Previously to injecting the oil, the valves *e* in the bar *a* should be screwed down to prevent the air from entering. A pipe from each end of *a* should be carried down, and then to the fore-part of the carriage, and end in a funnel.

To supply the gas for lighting the carriage, let the two centre bars, after passing through the back bar *b*, be united. There may be placed at *m* a three-way cock, to allow the passage of the air through the pipes by day, when the jet-caps are unscrewed; and a communication may be opened by the pipe *o* (which should pass through the cold water supply tank) with the gas-holder during the night, the oil to be injected into the bars *d d* alternately by the engine.

I remain, Sir,

Yours respectfully,

J. R. WHITE.

Wells, Somerset, Feb. 24, 1835.

P. S.—Has not Colonel Macerone given us a pretty good hint of the manner in which Dr. Church effects his condensation? There must, certainly, be some

strong resemblance between Mr. Hall's mode and Dr. Church's. Since speaking of one leads to mentioning the other, why not place Hall's fascine of condensing tubes horizontally, and supply the place of water with an air-draught or blast to the furnace, thus warming the air and condensing the steam?

J. R. W.

CHILDREN CHIMNEY-SWEEPERS.

Sir,—Junius must remember, that the particular form of chimneys enjoined by the Chimney-Sweepers' Regulation Act, was devised for the purpose of insuring, in all newly-built or altered chimneys, their capability of being swept by the machine. Whenever, therefore, you find that a chimney cannot be swept by the machine, you will at once perceive that the Act has been violated.

The master-builders will, I hope, not place themselves in the power of their workmen so readily as Junius appears to expect they will. Any one who had quarrelled with his employer might, without the probability of detection, apprise an informer of the infraction of the Act, and point out to him the evidence by which it might be proved.

I am, Sir,

Your obedient servant,

ARCHIBALD ROSSER.

15, New Boswell-court, Lincoln's-inn,
March 7, 1835.

ON THE PREPARATION OF BISTRE.

This colour, used by painters in the manner of Indian ink, is prepared from wood-soot, in the following manner:—Make choice of those pieces of soot which are the hardest, and adhere most to the chimney; pulverise them, and pass the powder through a fine sieve. Throw this powder into pure water, stir it from time to time with a glass spatula, leave it at rest; and, finally, pour off the water. This water dissolves all the foreign salts. We may hasten their solution by placing the glazed earthen vessel containing the mixture over a fire. When other water, on being added, will no longer dissolve any salt, and it remains of the same degree of specific gravity as before it was employed, we put the sediment into a tall narrow vessel, which is to be filled with water, and agitate it with the spatula; it is then left at rest for a few minutes, in order that the coarser parts may settle. The liquid is then to be poured into another similar vessel, and the coarser parts remaining at the bottom of the former one may be thrown away as useless.

This operation may be repeated two or three *times; and the oftener, the finer will be the bistre. It must be finally left at* rest for some time, *and the clear water poured off from the sediment, which is to be incorporated* with gum-water, and *it is fit for use.—Dict. Tech.*

THE PORTLAND BREAKWATER.

Sir,—I did not see Mr. Harvey's letter of the 16th Dec., 1834, inserted in your valuable publication of the 3d of January, Number 595, till yesterday; nor do I see how it promotes Mr. Harvey's object in proving that his father was the originator of a project for a breakwater at Portland, much less of the one suggested by me to Mr. Idle in 1812, and planned by Mr. Dodd early in September, 1813.

Mr. Harvey says his father had *designed and matured* a plan for a breakwater at Portland as early as 1794; on this point permit me to refer Mr. Harvey to his father's letter of the 30th Sept., 1813, inserted in your 586th Number, dated 31st Oct., 1834, wherein he says, "I am using my best endeavours to make calculations and complete drawings of the work," &c. &c.; and this was after Mr. Dodd's plans, &c., had been exhibited at Weymouth, and lodged with the Clerk of the Peace, and Mr. Henning had arranged for both the material and labour to carry Mr Dodd's plan into execution.

Mr. Harvey goes on to say that, *between* 1794 and 1814, a manuscript copy of "Remarks," by his father, pointing out the advantages of *the* plan, was shown to and read by a great many persons; and in 1814 these "Remarks" were printed, and 400 copies distributed.

Mr. Harvey does not state at what period of 1814 these "Remarks" were printed; but, on the 16th of December, 1814, I received a copy of them, with the following letter, from Mr. Dessiou:—

Portsmouth, 15th Dec. 1834.

Dear Sir,—I was in expectation of having heard from you ere now.

I have received the accompanying pamphlet from Mr. Harvey, of Weymouth, concerning the breakwater. I think there are some remarks in it which had better have been left out.

I have not heard a syllable concerning the breakwater, whether it is going on or abandoned. Please to inform me how you go on.

I am, dear Sir,

Yours most sincerely,

J. DESSIOU.

To Alex. Lamb, Esq.

The late Mr. Harvey did not, during our intercourse with him on the subject of the breakwater in 1813, produce, to either Mr. Dessiou or myself, the manuscript which had been shown to and read by so many other persons.

Mr. Harvey says that, on the 11th of November, 1813, a Report on the proposed breakwater, with a drawing of Portland and Weymouth, &c., was sent by his father to Christopher Idle, Esq., M.P. That, later in November, Mr. George Dodd, engineer, Mr. Dessiou, nautical surveyor, Mr. Latib,

solicitor, Mr. Idle, Mr. J. Harvey, and his son, John James Dunning Harvey, were engaged many days in surveying the coast, bay, and shambles; that shortly after Mr. George Dodd again came to Weymouth, and Mr. Harvey, sen., accompanied him to the high land of Portland.

Mr. Harvey, your correspondent, is mistaken in stating that the survey of Portland-roads was subsequent to the 11th of Nov. It was begun on the 1st of Nov., and the surveying vessel discharged on the 10th, on which day I paid Mr. Richard Tizard 11*l.* 0*s.* 6*d.* for the hire of her; Mr. Idle left Weymouth the day before, on the 9th of November.

If Mr. Harvey, sen. had matured *his* plan for *his* breakwater in 1794, the above survey was unnecessary. Why were many days employed, and heavy expenses incurred, in making this survey, if the late Mr. Harvey had one laying in his desk? How was it that he and his son assisted in making it, without stating that he had, years before, done all that was required, and all that Mr. Dodd, Mr. Dessiou, and Mr. Watkins, were then doing? Why, if he had his report and drawings ready, did he not deliver them to Mr. Idle before he left Weymouth on the 9th, instead of sending them after him on the 11th? All that I have to say is, that I never saw or heard of the late Mr. Harvey's report and drawing till I read your correspondent's letter yesterday.

Mr. Harvey says that his father's plan of breakwater in Portland-roads was laid before Lord Melville in 1814; this also is new to me, but on the 12th of Oct., 1813, Mr. Idle wrote me as follows:—

Adelphi, 12th Oct., 1813.

Dear Lamb,—Lord Melville appoints me to meet him at the Admiralty on Thursday at 12. Will you see that all the plans are sent to my house before that time.

Yours truly,

C. Idle.

Mr. Idle followed up his interview with Lord Melville, by requesting I would take Mr. Dessiou and Mr. Dodd down to Weymouth, to meet him and Mr. Watkins; and all the parties were assembled at Weymouth on the 31st of Oct., and commenced the survey upon the day following.

Mr. Idle's letter to the late Mr. Harvey, on the 23d of Aug., 1818, was obviously an answer to one from Mr. Harvey to him on the subject of the breakwater, the report and drawings for which Mr. Harvey had transmitted to Mr. Idle on the 11th of Nov. 1813; and as Mr. Idle had two plans before him, *one prepared by Mr. Dodd*, under his own directions, and one transmitted by Mr. Harvey, it was a matter of course for Mr. Idle to use the term *your plan*, in contradistinction to that of Mr. Dodd.

I have, in a former letter, stated that Mr. Idle was afflicted by paralysis; yet he was exceedingly desirous that no other person should be applied to on the subject of the breakwater, for he still hoped to recover so as to be able to carry it through himself. In 1818, Mr. Dodd had been writing to Mr. Henning on the subject, and it was deemed expedient that notices should be given of an intention to apply to Parliament; notices were accordingly published, to which Mr. Idle's attention having been drawn, he asked for an explanation, which, I have no doubt, I gave him in the way stated by your correspondent.

Mr. Harvey says, "I trust that no doubt can now remain as to my father being the originator of the project," &c. &c.

From the documents *produced by Mr. Harvey*, it appears that a breakwater in Portland-roads had been the subject of conversation as far back as the time of George the Third's visit to Weymouth; that Mr. Harvey had, from 1794, frequently talked about one to various persons, but without producing any impression; that, amongst others, he had named it to Mr. Bracebridge, who having it in contemplation to issue a prospectus for a joint stock company, wrote to Mr. Harvey for particulars; that, after Mr. Dodd had completed and exhibited his plans, and lodged them with the Clerk of the Peace, Mr. Harvey wrote Mr. Bracebridge on the 30th of Sept. 1813, that he had no doubt but that Mr. Dodd's survey and representation would be satisfactory, and that he, Mr. Harvey, was using his best endeavours to make calculations and complete drawings of the work, &c.; that the late Mr. Harvey and his son attended the survey made by Mr. Idle's orders, between the 1st and 10th of Nov., 1813; that, on the 11th of Nov. 1813, the late Mr. Harvey transmitted to Mr. Idle a Report about *a* breakwater, and *a Drawing of Portland and Weymouth*; and that this report and drawing had never been mentioned to Mr. Idle, or any of the persons with him, though Mr. Harvey had seen Mr. Idle and them many days while attending the survey I therefore submit, that the fair inference is, that the late Mr. Harvey was not the original projector of *a* breakwater at Portland; that he did not suggest *the* breakwater for which Mr. Dodd prepared plans, sections, and estimates in Sept., 1813, and which were submitted to Lord Melville on the Thursday following, the 12th of Oct., 1813; that Mr. Harvey was not in possession of sufficient

materials for *any* plan or report respecting a breakwater, till after his and his son's attendance on the survey made in the beginning of Nov. 1813; and that he never mentioned the subject to Mr. Idle till he transmitted the report and drawing sent on the 11th of November, 1813.

I am, Sir,

Your most obedient servant,

ALEX. LAMB.

2, Manchester Buildings,
March 4, 1835.

STEAM-CARRIAGES ON COMMON ROADS—
—MR. WITTY'S MODE OF PROPULSION
—MR. GURNEY'S CLAIMS.

Sir,—If the Working Mechanic, in No. 601, page 346, had not gone the length of claiming for Mr. Witty's plan of propelling carriages superiority over "all others now in use," I had not troubled you with this. I also have paid much attention to Mr. W.'s plan, and own it will efficiently propel a carriage, but I object to loading the vehicle with three cylinders and their apparatus, when two will do better, as the blank stroke is a loss.

Let the Working Mechanic arrange his weights so as to imitate *the return stroke* of a close-topped cylinder, and he will find the carriage will advance just the same as it did before with the direct stroke, so that the blank stroke is a loss, not of steam, but as far as extra weight and friction of machinery go, which is a great object on common roads.

Let him not forget that the *locomotive fulcrum is on the road*, and not at the axles, so that the propelling lever, which in the first or direct stroke is the longest, becomes the shortest in the second or return stroke, and produces the effect I have mentioned above.

I beg leave to put in my claim to a share of the Parliamentary reward; as, whilst Mr. Gurney and others were taking out patents for "propellers" of every grade, I was labouring to prove them useless, and show that by a proper adjustment of the load on the motive wheels any obstacle or steep might be surmounted, with equivalent power, on plain wheels.

I certainly was the first that practically exhibited this, and publicly claimed it, then and since, and do now again claim it, having made a steam-carriage go up, on plain wheels, an incline rising 1 in 6, when such a thing was thought impossible.

Talk not of tolls and mended roads stopping steam-carriages—it is all fudge! Those obstacles would soon have vanished, had there not been far greater ones, *weight* without *substantial* equivalent power. Horses are yet going on the worst of mended roads.

I admire Mr. Gurney's perseverance, but I believe he was well backed; I watched his progress, and the result in my mind is this,—that he showed it was impossible for him profitably to work quick-going steam-carriages on common roads, not perhaps nice level roads, under very favourable circumstances, but "*communibus roadibus*" (Dr. Johnson); and I still consider it impossible. What is become of the steam-waggon?—that is my mark, if I had the means.

Yours, &c.

SAXULA.

March 7, 1835.

THE CABINET CYCLOPÆDIA.

A most characteristic volume of this series has just made its appearance, having for its title, "The Lives of Eminent Literary and Scientific Men of *Italy*, *Spain*, and *Portugal*,"* while its frontispiece is decorated with portraits of Dante, Boccaccio, *Chaucer*, and *Copernicus!* This is a fair average specimen of the method—the truly careful method—in which the work has usually been conducted. We have been told that each volume is complete in itself, and then been referred to another, on a widely foreign subject, for the index to this. We have been treated to a "complete" History of Philosophy, which omits the most interesting period of that history, for "want of room." We have had a History of Spain and Portugal, which includes about a tenth part of that history in the first four volumes, and yet, very systematically, presents us with the remaining nine-tenths in the fifth and last. All these offences, and more, has Dr. Lardner perpetrated with an un-

* Vol. i. (Cabinet Cyclopædia, vol. lxiii.) London: 1835. Longman and Co., and John Taylor. Small 8vo. Pp. 312.

moved countenance. Why, then, may he not be permitted to set down Copernicus as one of the great *Poets of Italy*, or to maintain that Chaucer is one of the profoundest of *Portuguese philosophers?* He might just as reasonably stand to these assertions, as to the one we are about to notice.

This is, that the Cyclopædia is now half-way towards its completion, and that "no departure has been, or is intended to be made," from the "general design" of the work, to which the conductors desire to "recall the recollection of the subscribers." Fortunately, the original prospectus is bound up with the first volume, so that the subscribers can easily refresh their memories, should they chance to be rather confused on the subject, after being dizzied by Dr. Lardner's various feats of hocus-pocus. We have taken the trouble to refer to this valuable document, for, "seeing what we have seen, seeing what we see," we could not help thinking that "the conductors" must have been lying—under a very great mistake, when they thought proper to volunteer the assertion in question so broadly; and the result has confirmed us in this opinion. Truth to say, the original plan, from which, we are told, there "has been no departure," has been departed from in almost every instance where it could possibly be. Even of the particular works then announced as being in preparation, and in the plan of which, therefore, no alteration could reasonably be anticipated, scarcely one has since appeared in a form answering to the terms of the announcement. Thus, the "Lives of British Statesmen" were to be written by Sir James Mackintosh. One volume has appeared, in which one life only is the production of Sir James, the rest being either put together by some obscure anonyme, or copied verbatim from M'Diarmid's well-known work, and so affording a capital comment on that paragraph of the prospectus which assures the public that "the Cabinet Cyclopædia" was not intended to be formed of materials merely compiled from works already published"! Again, the History of England was to be comprised in three volumes, by the same distinguished author; we have been already presented with *three*, containing the early history, nominally written by *Sir James, but, in fact,* judging from internal evidence, only put together from his loose and disjointed papers,—and we are to have *five* more from some nameless continuator. The History of Ireland, by "Thomas Moore, Esq.," was said to be nearly ready, "in one volume." As yet this has not made its appearance, but we are now promised, on the *first* of April, one of *three* volumes on the subject (still, strange to say, by the same author). And so on to the end of the chapter. The Treatise on Chemistry was to be supplied by Professor Turner, of the London University;—that job has been done by the Doctor's friend and fellow-countryman, Mr. Donovan. The History of Greece, in *two* vols., was to come out forthwith:—"the cry is still it comes," but now in *three.* The same with the History of France, except that *that* is out, so that there can be no fear of further enlargement in that quarter:—and the same with the History of Maritime Discovery.

But the most notable "departure" of this sort occurs in the case of "Natural History." With what a flourish of trumpets did Dr. Lardner make known to the public the important fact, that he had prevailed on a whole host of the first scientific characters in the nation to contribute to his grand work; and that, in especial, it would contain "A Popular View of Natural History," such as the world had never seen before, by "the following eminent naturalists," to wit, thirteen of the most celebrated men of the day in that department! And how have the expectations thus raised been answered? Why, after looking in vain for this brilliant galaxy, "in twelve volumes," for thrice as many months, the public has been told at last that this department of the work will be a little enlarged (to seventeen volumes, we believe), but that, at the same time, the number of contributors will be a little diminished:—in short, that the whole series, with very trifling exceptions, has been undertaken by one individual, and that individual, as it happens, not even a solitary member of the club of "eminent naturalists" who were to have produced the amazing paragon, according to the first intention! How fine an instance of pertinacious adherence to the original plan is this, in all its bearings!—how complete a justification of the conductor's well-timed boasting!

But all this is nothing—a mere trifle, compared to what remains behind. Some time ago, we recollect having had occasion to take Dr. Lardner to task for broaching the monstrous idea that one-third of his Cyclopædia was then complete: now, however, he returns to the charge more boldly than ever, and, in the face of the world, proclaims that sixty-two volumes having appeared, one half of the work is absolutely finished; and this, too, without any departure from the general design. Now, this general design is comprised in the prospectus alluded to;—and it is only necessary to refer, first to that, and then to the list of works already published (given in order to "enable the subscribers and the public to perceive the present state of the work, and to estimate its future progress!"), to be convinced of the thorough hardihood, to say the least of it, possessed by the worthy Doctor, and of the extent at which he estimates the gullibility of the "reading public."

To begin with the division of "History," in which more volumes have appeared than in any other, and which, consequently, offers the best means of judging as to its probable extent. In the prospectus, we are told that this department would occupy "twenty-four volumes." But what is the fact? No less than *thirty three* volumes have been already published, and *twenty-one* more are announced as "in preparation:"—nor will these be any thing like sufficient to include the whole of the division. Fifty-four volumes devoted to a subject which was to be contained in twenty-four (perhaps fifty-four more yet to come), and, notwithstanding, the work is advertised as being conducted "*in conformity with the original prospectus!*" What code, of even professional morality, can justify so monstrous a "departure" from truth as this?

"Natural Philosophy" is another division which has been more worked than most of them. *Eight* volumes were assigned to this head; *nine* have already appeared; and we are promised shortly the remaining volumes, without any number being specified.

"Biography" has not been so well attended to, but nine volumes have come *out;* and the whole division is to consist, *according to the* prospectus, of twenty-*four. It is quite* ridiculous to suppose that any thing near a third part of this department has been sent forth. We have had a volume of Lives of "British Lawyers;" three of "British Military Commanders;" one, out of "about four," of Lives of "British Statesmen;" one of "Foreign Statesmen;" and three out of four of "British Naval Commanders;" to say nothing of the "Eminent Literary and Scientific Men of Italy, Spain, and Portugal," whose memoirs have just been begun upon. If the whole division is to be conducted upon a commensurate scale, we have little hesitation in saying, that it will require not less than a hundred volumes for that alone! Look at this last work, for instance; its author has not yet got through the poets only of Italy. At this rate, he will require at least a dozen volumes for the whole of his subject; and if so, to what an extent may not the forthcoming "Lives of the Eminent Literary and Scientific Characters of *England*" be expected to stretch? The four and-twenty volumes are so well mortgaged already, that it would puzzle any body but the bottle-conjuror to tell how to find room in the remainder for these lives only, to say nothing about the foreign worthies whose biography is indispensable in such a work.

"Geography" is in the same state; six volumes was the number assigned to this *rather* important science, and that it will not be included in a smaller space is tolerably evident from the fact, that, in the four which have hitherto been published, the only subjects disposed of are "The History of Maritime and Inland Discovery," and the "Cities and Principal Towns of Great Britain." The volume on the latter was to have been the first of a series on the Cities and Towns of the whole World; but that idea has apparently been abandoned, since, strangely enough, the work is entirely omitted in Dr. Lardner's catalogue of his published performances, as though he would have it forgotten altogether.

The section on "Arts and Manufactures" has proceeded to the extent of six volumes, ten having been originally allowed for it. As yet, however, many of the useful arts remain undescribed, and not a single page has been devoted to "The Fine Arts," which were to form a conspicuous feature in the division, nor is a single page announced. Has the Doctor determined to pass them silently

by? Or, if not, how would he be able to do justice to their importance, even if he could afford to them the whole of the two volumes which will remain after the Cotton Manufacture and Inland Transportare disposed of? And this he cannot.

Besides these divisions, each of which has far exceeded, or evidently will exceed, the limits marked out for it in the "original prospectus," there are actually three more which have not been even commenced, so that their whole bulk is yet to come; rendering it still *more impossible* than ever that the Cyclopædia should be concluded in the given space. These are "Philosophy," 6 vols.; "Literature," 6 vols.; and "The Cabinet Dictionary of Literature, Science, and Art," 6 vols, eighteen volumes altogether (supposing them not to increase in the process of publication), to be added to the already too weighty load of the unfortunate Doctor's obligations!

And yet, in the face of all this, the conductors of a work which has thus, in every department, and almost every particular, wandered away from its original plan, have the boldness to draw public attention to the fact, and to claim credit for their very delinquencies. It is quite in character with such a proceeding to assure the public that the Cyclopædia is already half completed, and to follow up that assurance by producing a "statement," to "enable them to judge of its present state and future progress;" from which very statement it is evident that not one-fourth of it (at a moderate estimate) has yet reached the world! The whole affair gives but a melancholy impression of the low ebb to which literary and commercial morality has fallen.

There is only one loop-hole by which we can conceive the Doctor to attempt his escape. He may object that our estimates are founded on the supposition that the future volumes are to bear some proportion to those already published, whereas, it is well-known, that no attention whatever has been paid to the proportion of its parts, from the very commencement of the undertaking. We must candidly confess, that this plea may be very strongly supported by reference to the by-gone history of the work. It may well be asked, upon what principle we expect any sympathy in a Cyclopædia, which allows four volumes to a History of Spain under the Mohammedan rule, and only three to the History of France under all the dynasties, "from the earliest periods to the present time." And with equal reason may it be urged, that the task of cramming the matter of some score of volumes into one must be light enough to him who could compress the History of Natural Philosophy since the time of Newton into some dozen pages, at the fag-end of a volume commencing on such a scale as would have required some thousands of pages for that period! In sober earnest, the "Cabinet Cyclopædia" is a work of so unequal and heterogeneous a character, that if it were continued till Doomsday, it would never make a perfect "whole;" and if it were discontinued to-morrow, the entire fabric would not be left more incomplete, than many of the single treatises of which it is composed. Some of these, individually, are, indeed, of first-rate excellence—an excellence which has been freely and universally acknowledged; but the merits of the few cannot compensate for the defects of the many, any more than one or two master-strokes can make that a capital painting which, in its "general design," is a mere daub. The simile is not a good one, after all; for the execution of the Cabinet Cyclopædia has been such, as to give rise to the impression that it was commenced without any regular "design" at all.

NOTES AND NOTICES.

Professor Airy, of Cambridge, has had a pension of 300*l.* a-year conferred on him by Government. Never was pension better deserved, or more judiciously conferred.

Brother Jonathan.—A joint commission having been appointed by the Governments of Great Britain and the United States, to determine the boundary line between the States and the British North American possessions, the American commissioners proposed that the latitude should be calculated geometrically, that is, from the centre of the earth, which they said was a far more scientific and satisfactory method than the ordinary one of calculating it superficially from the pole to the equator. The effect of this would have been to give the United States a tract of country extending from the Atlantic to the Pacific, and averaging 14 miles in breadth, to which by the usual mode of calculation they have no claim. Dr. Watson, to whom the British commissioners entrusted the scientific branch of the negotiation, quickly saw through the disinterested scheme of Brother Jonathan, and thereby preserved this large extent of territory to his own Government.

Miss Caroline Herschell and *Mrs. Somerville* have been unanimously elected honorary members of the Royal Astronomical Society.

Fulton's first Steam-Boat Model.—The first rough model of a steam-boat, made by Fulton in this city (New York), was cut out of a common shingle, shaped like a mackerel, with the paddles placed further before than behind, like the fins of a fish. The paddle-wheel had been first put in the rear, on the sculling principle, which was abandoned on consulting with Mr. Greenwood, a well-known ingenious dentist in New York, now deceased, in whose possession the model remained for many years. Old Admiral Landais, the enemy of Paul Jones, was also in frequent consultation with Greenwood at the time. He recommended the paddle-wheel to be placed in the stern, and to be moved by a funnel-shaped sail, which was to catch the wind even when it was directly a-head, and thus communicate the power by re-action to the wheel.—*New York Star.*

Steam v. Ice.—(From the *Baltimore American.*) —"Our eastern friends, whose harbours have all been blocked up by ice, will scarcely credit us when we tell them, that we have a steam-boat which has not ceased operations for a single day since the late cold weather set in, but has forced a passage through the ice—thick and hard as it has been—with one or more vessels in tow. The most remarkable performance of the Relief was on Friday last, after we had had a week of the most intensely cold weather experienced here for many years. About noon she started from the harbour, the brig Falcon in tow, and to the astonishment of all who witnessed it, made her way through ice a foot thick, and of a flinty hardness. Every inch of her progress was thus impeded until she had traversed the whole length of the Potapsco, and reached the broad expanse of the Chesapeake Bay. For the information of persons at a distance, who may be curious on the subject, we will state that the Relief is a steam-boat, the model of whose bow has a close resemblance to the bowl of a table-spoon. When she is propelled forward, the ice is not thrown before her, as it would be by an ordinary vessel, but passes under her bows, and is broken. The paddle-wheels are of wood and iron, and some idea of their strength and adaptation to this peculiar service may be formed, when we state that each wheel has in it six tons of iron." At New York steam boats were so much in demand during the frost, for towing vessels, that as high as thirty dollars an hour was paid; the common price is ten dollars an hour.

The Ship sinking System.—Captain Ballingall, whose unceasing efforts to awaken the public mind to a sense of the iniquitous system of marine insurance, are above all praise, affirms, on (apparently) good grounds, in a letter inserted in the last number of the Nautical Magazine, that no less than 600 of the 800 mercantile vessels lost in 1833 might have been saved, had they only been built like the Government vessels—*which are not insured.* During the same year there were 160 vessels of war in commission—*not one of which was lost.* Well may Mr. Cobbett talk of the money-monster with its huge snout! But for this, such a system would not be tolerated for a single day.

Preparation of Hemp.—It has long been a desideratum to discover a means of extracting the glutinous matter from hemp, and reducing it to a fine fibre, applicable to the same purpose as flax. Mr. Alexander Shanks, flax-spinner, Arbroath, is stated to have at length contrived a machine by which this is completely effected. When hemp is prepared and heckled by this machine, it is said *to be equal to the finest flax.* The machine is so contrived that the friction does not cut or injure the fibre, but simply removes the glutinous matter adhering to the trunk in its original state.

Rate of Progress of Storms and Hurricanes.—The rate at which the storms and hurricanes of America and the West Indies travel, is found to vary in different cases, but may be estimated at from twelve to thirty miles an hour. One of the hurricanes of August, 1830, has been traced in its daily progress from near the Caribbee islands to the coast of Florida and the Carolinas, and from thence to the banks of Newfoundland, a distance of more than 3,000 miles, which was passed over by the storm in six days. The duration of the most violent portion of this gale, at the different points over which it passed, was about twelve hours; but its entire duration was at many places more than twice that period. Another hurricane, which occurred in the same month, passed from near the Windward islands, on a more eastern but similar route, and has also been traced in its daily stages, by means of the journals and reports of voyagers, near 2,500 miles. The hurricane of August, 1831, which desolated the island of Barbadoes on the 10th of that month, passed in nearly a direct course to the northern shores of the Gulf of Mexico and New Orleans, where it arrived, on the 16th of the same month, having passed over a distance of 2,300 statute miles, in six days after leaving Barbadoes.—*American Journ. of Science and Arts.*

An Applicant for a Patent is not under the necessity of coming to town, unless in the event of the application being opposed. If our "Hallamshire" "Constant Reader" will inform us how we can address a letter to him, we shall send him instructions how to proceed.

To Wood Engravers.—We are in want of a good one.—Apply by letter, addressed to the Editor, containing a specimen and lowest average terms.

Communications received from Mr. Cheverton —Iver Mac Iver—Mentor—Libertus—J. H. M. C. —Mr. Dewhurst—Saxula—Mr. Deakin—Omicron —A Brickmaker.

The Supplement to Vol. XXI., with a Portrait, on Steel, of the late Mr. Telford, continues on sale, Price 6*d.*; also the Volume complete, in boards, Price 8*s.*

Errata.

Page 420, col. 2, line 10 from the bottom, for "left" read "right."

☞ The Editor of the Mechanics' Magazine has made such arrangements as enable him to offer, on unusually advantageous terms, to undertake the solicitation of Patents for New Inventions, the drawing and revising of Specifications, and generally every other branch of Patent business. Drawings of Machines executed with accuracy and dispatch.

6, Peterborough-court, Jan. 3, 1835.

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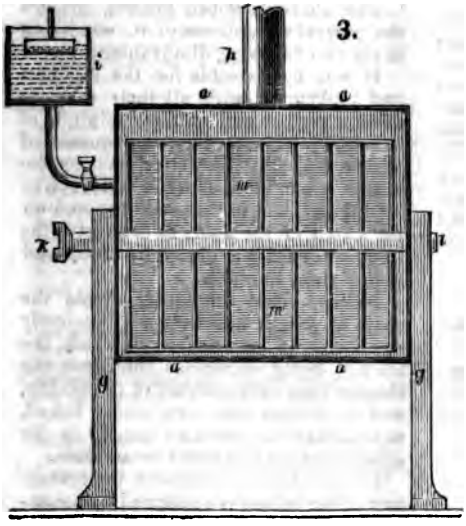
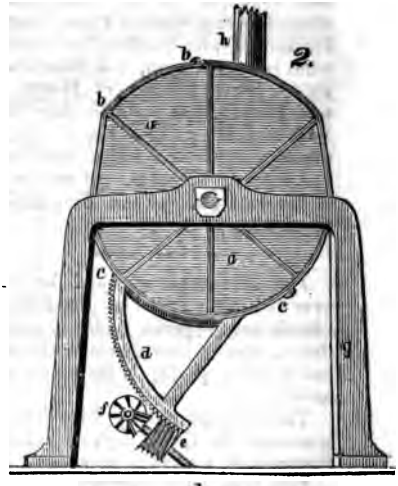
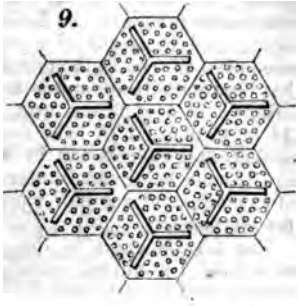
MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

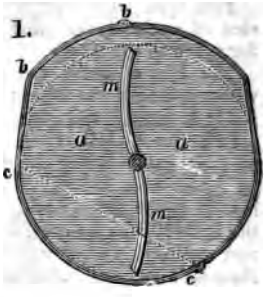
No. 606. SATURDAY, MARCH 21, 1835. Price 3d.

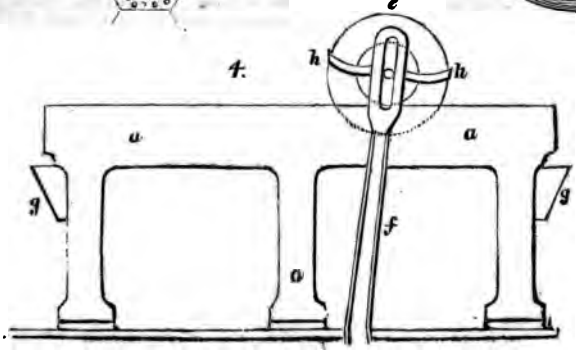
GRANT'S BISCUIT-BAKING APPARATUS.











GRANT'S BISCUIT-BAKING APPARATUS.

In our nineteenth vol., p. 14, we gave a general description, extracted from the United Service Journal, of the biscuit-baking machinery invented by Mr. Thomas Grant, of his Majesty's dock-yard, Portsmouth, for which he received a grant from Government of 2,000*l*. The first apparatus of this description was erected at the Weovill Victualling Establishment; and another, but on a somewhat improved plan, has been since put up at the bakehouse of Messrs. Fraser and Hullah, the eminent ships' biscuit-bakers of Wapping. For the following description of the latter, with the accompanying sketches, we are indebted to the last Part of the Transactions of the Society of Arts.

The advantages claimed for the new over the old method of preparing ships' biscuit are, superior economy and expedition, greater cleanliness in the process, and a better quality in the manufactured article.

The mode of making ships' biscuits, as practised in the King's bakehouse at Portsmouth, was as follows:—

Five men were appointed to the service of each of the nine ovens, being forty-five in the whole.

The first of these was the idleman, whose business was to mix the meal and water in due proportions, and to incorporate the materials as accurately as possible, by kneading the dough for half an hour with his naked arms plunged into it up to the elbows, and finishing the operation by jumping into the trough, and treading the dough with his feet. Hence it passed to the brakeman, who completed the kneading by means of a lever, on which he pressed with his whole weight; this part of the process being called riding down the dough.

It then passed into the hands of the furner, who first divided the dough into lumps somewhat bigger than an egg, and passed them to his mate, who pressed and moulded each by hand into the form of a biscuit, and finished by pricking them with an iron instrument, to prevent blisters from rising in the *dough during baking*.

The biscuits being thus formed were *supplied in* succession to the pitcher, who threw each on the peel of the furner as soon as he had deposited the previous one in its proper place in the oven. Each one was capable of holding 450 biscuits, weighing together 1 cwt. and two charges; that is to say, 900 biscuits were baked in an hour.

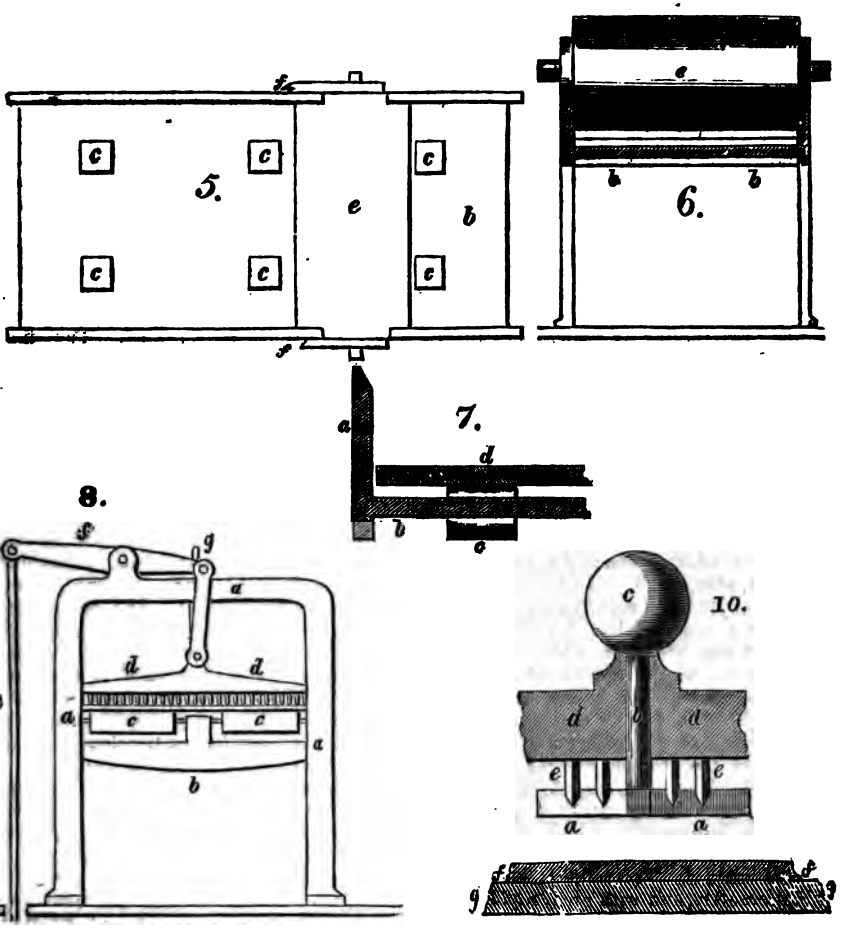
The above described process, besides the general slovenliness of it, was liable to the two following disadvantages:—

It was not possible for the idleman and brakeman, with all their care, to effect a perfect and uniform mixture of the flour and water; the consequence of which was, that the wetter portions detained some of the water till it was boiling hot, and in that state re-acted on the starch of the flour, so as to give the biscuit when dry a glossy fracture, and almost stony hardness.

Neither could the furner divide the mass of dough into lumps of perfectly equal size, in consequence of which, the biscuits being of various thickness, the thinner ones were scorched in the baking, and the thicker ones were under baked, so that they soon became mouldy in the close warm air of a ship's bread-room.

In Mr. Grant's apparatus, the greater part of the labour is performed by steam-power: the nine ovens are heated by one continuous fire-place, the flame of which is admitted by means of a register into each oven as soon as the previous charge has been withdrawn, and in five minutes brings it to a sufficient heat. It takes 14 or 15 minutes to bake each charge, so that three charges can be worked off in one hour, being an advantage, in point of expedition, of one-half more than by the old method.

The first machine is the mixer, of which fig. 1 is an end elevation; fig. 2 a transverse section; and fig. 3 a longitudinal section. It consists of a cast-iron case, *a a*, nearly 4 feet long and 3 feet in diameter, enlarged, however, at the upper part, a few inches beyond the circular form, as shown by the upper dotted line in fig. 2. The radial lines in fig. 2 are merely ribs to strengthen the case. A flap, or door, *b b*, the whole length of the case, opens inwards, to enable the workmen at any time to inspect the interior; and another larger flap or door, *c c*, opens downwards for the purpose of removing the contents of the case. This latter door is opened and shut by means of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a quadrant rack, *d*, worked by an endless screw, *e*, which is moved by a pair of bevel pinions, *f*, and these are acted upon by a small winch and axle, attached to the supports, *g g*. The operation of the machine is as follows:—The requisite quantity of flour is sent down from the loft above by the shoot, *h*, and the proper quantity of water is supplied from the small cistern, *i*, which has a float and guage, with a line and pulley, to indicate the quantity admitted from a larger cistern above, and a pipe and cock to convey the water into the case. The flour and water being admitted, the central axle, or shaft, *k l*, is put into gear with the steam-engine, by means of the coupling-box, *k*; the axis is made to revolve very rapidly, carrying round with it the frame of 18 knives or mixers, *m m*. These knives, which are curved, as shown in fig. 2, are 2 inches wide, and $\frac{3}{8}$ of an inch thick at the back: they are connected at their extremities by similar longitudinal knives, which, in revolving, almost touch the bottom of the case. By these means it is evident that the flour and water must in a short time become thoroughly mixed. The paste is then removed by hand through the door, *c c*, and placed upon a table, which is as close as convenient to the mixer, and which is now to be described.

This table is shown in an elevation, fig. 4, plan, fig. 5, and transverse section, fig. 6. It has a cast-iron frame and legs, *a a a*, a cast-iron bed, *b b* (6½ feet long and 3 feet wide), in which are the six holes, *c c*, &c., to receive friction rollers, on which run the boards to receive the dough. Fig. 7 is an enlarged section of the side *a* of the table; *b* is the bed; *c* one of the friction rollers; and *d* the board. The sides, *a a*, of the table, support a very heavy cast-iron roller, *e*, 18 inches in diameter, which, when resting on the table, is about 2 inches clear of the board *d*. This roller is made to run alternately, and with great rapidity, from one end of the table to the other, by means of a pair of beams, 10 or 11 feet long, attached to centres below the floor under the table, and made to alternate by a crank from the steam-engine; the *upper end* of one of these beams is seen *at f, fig. 4, showing* the groove, in its *extremity, to allow* the axis of the roller *to play in it* as the beam alternates.

It will now be evident that, when a mass of dough or paste is taken from the mixer and placed upon the table, it must be compressed by the rollers into a cake equal in thickness to the distance of the roller from the board, which is, in this case, two inches.

During this process, a considerable quantity of dry flour is sprinkled upon the dough and the board, a large portion of which would be swept off by the roller and lost, but for the troughs, *g g*, at the end of the board, which catch and retain it. Notwithstanding this sprinkling with dry flour, a small quantity of dough occasionally adheres to the roller, were it not kept constantly and perfectly clean by means of two thin knives, extending on opposite sides against its whole length, and attached to two pairs of curved arms, one of which, *h h*, is seen fixed to the beam *f*. When this operation is finished the board with the dough is withdrawn, and another board introduced, on which the operation is repeated. The first board and dough being withdrawn, are conveyed, on a series of friction rollers, to a second table, precisely similar to that just described, except that the roller approaches to the board within such a distance as is required for the thickness of the biscuit. The dough, which was reduced to a cake two inches thick at the first table, is cut into pieces, and laid in portions on the second table, where it is quickly brought down to the proper thickness for biscuits. The board containing this comparatively thin sheet of dough is pushed forward, still running on friction rollers, towards a machine next to be described, while the workmen at the second table repeat their operations on the fresh portions of the dough which they have received from the first.

The machine, towards which the board and sheet of dough now rolls, is shown in fig. 8. It consists of a strong cast-iron frame, *a a a*, with cross-beams *b*, supporting three or more pairs of rollers, *c c*, on which the board is pushed. Immediately above is a thick plate of iron, *d d*, 3 feet square, which is made to ascend and descend alternately by an excentric, which acts upon the rod *e*, the lever *f*, and the guide-rod *g*. The iron plate, *d*, is shown in the figure at its lowest position; it is, of course, at its highest when the dough and board are brought under it. When this is done it descends and cuts the dough into hexa-

gonal pieces or biscuits, by means of thin knives, 1 inch wide, affixed to its under surface, and arranged so as to form hexagonal spaces. A small part of the under side of the plate, *a a*, is shown on a larger scale at fig. 9, where, in addition to a portion of the hexagonal knives or cutters, will be seen a number of small dots, which indicate the pins or prickers to give the requisite punctures to the biscuits before they are baked; these pins are as long as the depth of the cutters, that is to say, 1 inch; they are about one-third of an inch in diameter, and pointed at their extremities. The effect of all these cutters and pins would, however, be to cause the plate *a* to cling to, and lift with it, the sheet of dough. In order to prevent this a very ingenious contrivance is introduced, a part of which will be observed in fig. 9. In each hexagon will be seen three arms branching from the centre. These are formed of iron, and each set is connected with a small vertical iron stem, which passes through the plate *d*, moving easily, and is surmounted by an iron ball 2 inches in diameter, acting as a weight to press the stem and arms downwards. One of these balls with its stem and arms, and a portion of the plate, *d d*, is shown in fig. 10, where *a a* are the three arms, *b* the stem, *c* the ball, *f f* a portion of the dough, and *g g* a part of the board beneath. It will easily be understood, that when the plate *d d* rises, the stem *b* will drop through its hole, pressed by the ball *c*, and acting on the dough by the arms *a a*, will disengage it from the hold of the cutters and prickers. When the plate, *d d*, descends to cut the dough, of course the arms *a a a* rise up to the plate, and the stem rises upwards in its hole, carrying with it the ball. There are as many of these balls and stems as there are biscuits, that is to say, about 60 in each square of 3 feet. These balls would, therefore, be seen on the upper side of the plate *d* in fig. 8; but they are omitted for the sake of avoiding confusion.

The hexagonal cutters do not so completely separate the sheet of dough as to prevent its being put whole into the oven, into which it is introduced by being laid on a plate of iron, which fits on to the handle of the peel by a bayonet-joint. The sheet of dough when baked is broken into biscuits, which take the form marked out by the cutters.

The arrangement of the several machines would, in some measure, depend on the form of the building, and other circumstances. They should be as near together as convenient, in order that the boards may pass from one to the other on rollers; the mixing machine should be near the water and flour, and the cutting-machine should be near the oven. A series of rollers should be fixed against the wall, for the purpose of returning the boards to the first table after they have been emptied. At Portsmouth this series of rollers was kept constantly revolving by the steam-engine, so that when the empty boards were placed upon any part of the line, they travelled up to the mixer without further attention.

REMARKS ON MR. STEPHENSON'S REPORT ON THE UNDULATING RAILWAY.

Sir,—To all Mr. Robert Stephenson's practical objections to the undulating railway in No. 603, page 390, I submit, as I believe them of considerable weight in the present state of railway conveyance, but he must allow me still to doubt the correctness of his theoretical conclusions as to there being no power *saved*.

Mr. S. says, at page 388,

"A C, a horizontal plane

A B and B C, two inclined planes, completing one undulation.

Let n=sine of angle of inclination,
g=force of gravity,
m=mechanical force applied,
f=retarding force arising from friction."

"Then the force resulting from the combined action of these three will be represented by $n\,g+m-f-(m-f)$: it is evident that the motion of the body is influenced solely by the remaining force $n\,g$, and is precisely in the same condition as if friction were annihilated."

Just so, when $m = f$, as it is meant to do here. Now *n g is a power that costs nothing*, and yet takes the carriage from A through B to C. It cannot be so taken on the horizontal line—an artificial power must be applied. Is there not a saving, then, here—if there be no ultimate gain of power?

Again, he says,—"Instead of moving on an undulating surface, let the body be now placed on the horizontal plane A C, its motion in this condition can be influenced by two forces only, viz.: the mechanical force m, and the retarding force f. If we suppose, therefore, $m = f$, it is obvious that no motion whatever can take place."

True, yet, on the undulating line, with only the mechanical force $m = f$, the carriage is forwarded to C. Am I wrong?

Again, he says,—"Let $p =$ power expended in communicating any given velocity to the body on the horizontal surface at A, then the whole power expended in moving the body from A to C will be $p + s\,m$, or $p + s\,f$."

But on the undulating line p is not wanted to take the carriage to C, although, I admit, it will be stationary when it arrives there.

Again, he says,—"m must exceed f, otherwise no motion could ensue on the level plane." But on the undulating line $m = f$ is sufficient to produce motion to C. Is there not a saving here?

Again, he says (before the last quotation),—"But when the body arrives at C (on the level line) it retains its original velocity, and is capable of employing its power, or of moving itself beyond C: whereas on the undulating surface the body becomes quite stationary at C."

Granting this to be so, is there not a needless application of power here? (and consequently a waste in some shape or other;) because, on the undulating line, the carriage will arrive at C, or at an endless succession of C's, without it, or with a power $m = f$; whereas on the horizontal line the carriage cannot start with $m = f$, but must have p applied, if p be only considered as borrowed,

"And borrowing dulls the edge of husbandry."

Unless Mr. Stephenson contend that the $p + s$ of his argument be, *in fact*, only *nominal, which I think* can scarcely be.

I must confess Mr. S.'s reasoning had laid before me a more clear and exact state of the case than I had any previous knowledge of. I much wish to see Mr. Badnall's reply to it.

A short time ago, I, as one of a Railway Committee, urged the consideration of a single undulation to cross a valley without embanking; but it was quite overruled by the following argument:—"Suppose an accident should happen at the bottom of the curve, how could the train get up the remaining incline?" Hard is the lot of the poor projector, who must overcome all possible difficulties before he can get any encouragement.

I am, Sir, yours, &c.

SAXULA.

March 4, 1835.

Mr. Editor,—As none of your correspondents have pointed out the inaccuracies in the analytical investigation of the undulating railroad problem given by Mr. Whitehead, or shown the deficiency in the investigation to embrace the whole of that question, permit me, in few words, to point them out—particularly as his views, in a great degree, coincide with the opinions of that very eminent engineer, Mr. Stephenson.

Mr. Whitehead takes three views of this question.

1. In the first case, he assumes that the force made use of to balance friction is not brought into action until after the momentum of the body, acquired in descending the inclined plane, is expended in the ascent of the opposite plane. But as this is not Mr. Badnall's mode of applying the principle in practice, and is only a modification of the general principle in the next case, it is unnecessary to comment on it.

2. In the second case, he assumes that the power opposed to friction is equal to and balanced by that force. This is a case of some importance, and has not been sufficiently attended to and investigated by Mr. Badnall's opponents. The limitations in this case must be strictly attended to, and no additional force whatever can be introduced in it without vitiating the analysis. Mr. Whitehead has not done so; for, during the progress of the investigation, he as-

sumes that the body on the horizontal plane may have a velocity given to it equal to the average velocity of the body on the undulating line. This cannot be admitted, for the two powers opposed to each other on the former line are, by the terms, equal, and no motion can in consequence take place—for where the opposing forces are equal this must be the result. Mr. Stephenson, who has not gone so much into the details, but coincides in opinion with Mentor, says, in reference to this case, that when a velocity is given to a body on the horizontal line, equal to the average velocity of the body on the other line, that then both lines will be passed over in equal times. Certainly they will; but what is this but saying, if you increase the moving power on the one line you will thereby equal the velocity of the moving body on the other line? There are two modes of applying this additional power, to gain the average velocity alluded to,—one by increasing the locomotive power, which is the only practical way of doing it; the other by giving an impulse of sufficient power at starting. Mr. Badnall's opponents seem to like this latter mode; but in the investigation it makes no difference, for the power that would disturb and give motion to the vis-inertia of—it may be, a body weighing 50 tons or more—is such a force as could not be left out of the inquiry. When this additional power is brought into operation, both lines must have the advantage of it; and this brings us to Mr. Whitehead's third case.

3. In this third case he assumes that both bodies, at starting, have acquired a certain momentum by descending two equal inclined planes, and consequently that both start with an uniform velocity. This is stating the case fairly, and, accordingly, in this investigation, he finds that the body does move in a shorter space of time on the undulating than on the horizontal line, and has given accurate calculations of the same, from given data, demonstrating, in the most satisfactory manner, the triumph of Mr. Badnall's principle. But here again, he travels out of the case he himself laid down, and says the advantage is only apparent, and that he is not to be bound or limited to any particular manner of applying the motive power on the horizontal line. As he has given no other *case however, save these* three, it would be useless to speculate on what other manner he intends doing so. Mr. Stephenson, in reference to this case, says, that as the velocity of the body at the termination of each line is equal, that the moving power cannot have more efficiency on one line than on the other; it is clear, however, from Mr. Whitehead's analysis mentioned above, from Mr. Hutton's demonstration, alluded to in a former paper of mine, and from actual experiments made, as recorded in your Magazine, that the body does pass in a much shorter space of time over the undulating than over the horizontal line. A very important experiment performed at the Adelaide Gallery has not been investigated by either of these gentlemen, namely, where a greater load was brought from the bottom of an inclined plane to the top, when this plane is formed of a series of undulating planes, than when it was formed in a straight line. But the experiments of the most importance were those performed at the Sutton inclined plane, and the mathematical investigation of the undulating problem cannot be complete, where such experiments are not included in the inquiry, because the power, in this case, employed is of such a variable nature, and the intensity of force so considerably reduced when the velocities are great, that the cases brought forward by Mr. Whitehead bear no similarity to it.

I am, Sir, yours, &c.

MENTOR.

March 6, 1835.

Sir,—I have never taken an active part in the controversy which has been carried on, in your valuable Journal, respecting the undulating railway system. I once expressed an opinion, in the Mech. Mag., favourable to Mr. Badnall's views (and I am still of the same opinion); but, as I perceived his supporters were fully a match for his antagonists, I considered that any assistance I could give them was not required. I now find, from your 403d Number, that a memorial (suggested by Drs. Dalton and Lardner) has been laid before the Directors of the London and Birmingham Railway, suggesting the expediency of making an experiment, to test the soundness of Mr.

Badnall's theory, on the said railway, extending over a distance of eight or ten miles. In consequence of that memorial, Robert Stephenson, Esq., C. E. (the son, I believe, of Mr. George Stephenson, the eminent engineer of the Liverpool and Manchester Railway), in his Report to the Directors, has settled the question (in his own way, that is to say, and, no doubt, to his own satisfaction) completely against Mr. Badnall's undulating system. Mr. R. Stephenson has employed nearly two columns in laying down certain first principles, by which his readers may the more readily understand a proposition, the truth of which he wishes to establish. He is abundantly diffuse on those first principles, but in discussing the proposition itself (upon which the whole depends) he has gone quite into an opposite extreme. He says,—

"If v and v' represent the velocities generated by the forces ng and d in the same time, then $v+v'$ will represent the velocities which the joint forces will generate in an equal space of time. But the velocity given by the force ng, in descending, is lost in ascending; hence, the body will arrive at the summit of each undulation with the velocity due to the action of the force d, which is $\sqrt{2ds}$.

"Now, the velocity acquired by the action of the force d on the level plane, the body having moved over an equal space, is also $\sqrt{2ds}$; and this equality in velocity must hold, whatever be the nature of the surface over which the bodies move, undulatory or level."

From the above demonstration (if so it may be called), Mr. Stephenson would seem to suppose, that the force produced by steam is a uniform force, like that of gravity (a supposition enough to disturb any one's gravity), or rather that gravity is a thing which has no influence whatever in the matter. It is true he has designated it by the symbol ng; but he positively asserts, that if a body be urged down a plane by two forces, ng and d, whose length is s, then this last acquired velocity is $\sqrt{2ds}$; and that, if the same body be urged forward on a horizontal plane by the *single* force d, after passing *over an equal space* s, the last acquired *velocity is also* $\sqrt{2ds}$! From this it must follow, as sure as two and two make four, that there is either no such thing as gravity, or if there be, that one-half of its force acts downwards, and the other half upwards; so that the two forces mutually destroy one another! Further, that if $\sqrt{2ds}$ is a true expression for the *final* velocity, then, as s increases, so does $\sqrt{2ds}$; that is, there can be no limit to the velocity upon a horizontal plane!

From Mr. Badnall's last communication in the Mech. Mag. (596), I am of opinion that he has been hardly dealt with. He states that it was with an old crazy engine, whose power was only sufficient to drag a load of 15 tons up an inclined plane of 1 in 84, that he made the experiments on the Whiston undulating railway in the presence of Mr. Robert Stephenson, sen., and Mr. Gill (both engineers, I believe), and yet he clearly established this fact, that the said old crazy engine was capable of dragging a load of 80 tons from summit to summit. It is true the exact inclination of the two planes has not yet been given by Mr. Badnall. But that is not a matter of very great consequence; for I think even Mr. Robert Stephenson will hardly contend that the old crazy engine is capable of moving 80 tons on a horizontal plane.

Mr. Stephenson insists much on the advantage of uniform velocities. But let us suppose that d denotes the average velocity, per second, in feet, in moving over a space $2s$ on a horizontal plane; then, in moving over half that space on an inclined descending plane, the force of steam being applied, the average velocity d will be obtained almost in an instant; the last acquired velocity will be $d+\sqrt{2gsn}$; the velocity preserved on reaching the summit will be d; and the average velocity from summit to summit will be $d+\frac{1}{2}\sqrt{2gsn}$. Now, when the spaces passed over are equal, the times must be inversely as the velocities: hence the time in the horizontal plane is to the time in the undulating plane as $d+\frac{1}{2}\sqrt{2gsn} : d$, and the power expended will be in the same proportion.

I am, Sir, yours, &c.

IVER MACIVER.

March 10, 1835.

EXPLANATION OF THE CHARGE OF MISREPRESENTATION BROUGHT BY THE EDITOR OF THE MECHANICS' MAGAZINE AGAINST LORD BROUGHAM, IN REGARD TO THE RISE OF MECHANICS' INSTITUTIONS IN ENGLAND.

[Mr. Cunningham, our publisher, having forwarded to Lord Brougham a copy of the Magazine of the 7th inst., which contained a paragraph impugning the correctness of certain statements made by his Lordship on different occasions, respecting the rise of Mechanics' Institutions in England, the following correspondence has taken place on the subject.]

Lord Brougham to Mr. Cunningham.

Lord Brougham's compliments to Mr. Cunningham, and requests he will have the goodness to explain the meaning of the paragraph marked in the inclosed Magazine, which Lord Brougham presumes is sent by Mr. Cunningham. Lord Brougham always understood Dr. Birkbeck to be the founder of the London Mechanics' Institution, and never heard of any other.

Berkeley-square, March 7, 1835.

Mr. Cunningham to Lord Brougham.

Mr. Cunningham presents his most respectful compliments to Lord Brougham, and has the honour to acknowledge the receipt of his Lordship's note, requesting that Mr. Cunningham will explain the meaning of a paragraph respecting his Lordship, which appeared in the last Number of the Mech. Mag. Mr. Cunningham has forwarded the note to Mr. Robertson, the Editor of the Magazine, and author of the paragraph in question, who will no doubt immediately furnish Lord Brougham with the desired explanation.

6, Peterborough-court, March 9, 1835.

Mr. Robertson to Lord Brougham.

Mr. Robertson received last night from his publisher, Mr. Cunningham, a note, addressed to him by Lord Brougham, in which his Lordship requests Mr. Cunningham will explain the meaning of a paragraph, which appeared in the Mech. Mag. of Saturday last, in order that Mr. Robertson may, as the author of the paragraph, furnish Lord Brougham with the desired explanation.

Mr. Robertson now readily complies with his Lordship's request.

The paragraph complained of, charges Lord Brougham with being in the habit of ascribing to Dr. Birkbeck the merit of being the founder of the London Mechanics' Institution, which gave rise to so many other similar institutions throughout England, while, at the same time, it is well known to his Lordship, and is an undeniable fact, that the merit belongs to another.

In answer to so much of this charge as relates to Lord Brougham's personal knowledge on the subject, his Lordship observes in the note to Mr. Cunningham, "Lord Brougham always understood Dr. Birkbeck to be the founder of the London Mechanics' Institution, and never heard of any other."

Had this, indeed, always been the case—had Lord Brougham never heard of any other claimant to the honour than Dr. Birkbeck—then Mr. Robertson must have done great injustice to his Lordship by his remarks; but Mr. R. believes that he has it in his power to bring such facts and circumstances to Lord Brougham's recollection, as must make his Lordship himself doubt the correctness of his present impressions on the subject, and as will at all events satisfy Lord Brougham that it was not without ample presumptive proof, that Mr. R. supposed his Lordship to be well aware of the real extent of Dr. Birkbeck's pretensions.

In the Mech. Mag. for June 16, 1827 (a copy of which accompanies this note), there is given an historical summary of the circumstances attending the origin of the London Mechanics' Institution; and as the correctness of that summary has never, during the more than seven years that have since elapsed, been disputed in a single particular, it may now be considered as entirely and indisputably correct. Mr. R. will, therefore, content himself with repeating here the principal heads of that summary, with such additions only as may be necessary to mark out more distinctly Lord Brougham's knowledge of or participancy in certain of the proceedings narrated, or to elucidate their bearing on the point at issue.

1. Mr. Robertson, the projector of the Mechanics' Magazine, and Editor of it from its first commencement to the present time, having, almost immediately after setting on foot that Journal, conceived the project of establishing a Mechanics' Institution in London, communicated his ideas on the subject to Mr. Thomas Hodgskin, whom he had employed as an assistant in conducting some of the earlier Numbers of the Magazine, requesting him to prepare an Address to the Mechanics of London, inviting them to associate for that purpose.

2. Mr. Hodgskin accordingly drew up the Address, which, after being revised by Mr. Robertson, was published in the Mechanics' Magazine, No. 7, Oct. 11, 1823.

3. Mr. Robertson wrote the paper in the following Number for October 18, 1823, describing the favourable reception which the Address had experienced, enforcing its views,

and stating, among other things, that "the first gentleman *who had responded to the invitation*" was *Dr. George Birkbeck*.

Of Dr. Birkbeck, Mr. Robertson up to this time knew nothing; he had never even heard of his name. The letter in which Dr. Birkbeck responded to the invitation, closed with these words:—"It will afford me the greatest pleasure to give you any information which you may require respecting the original Mechanics' Class in Glasgow, and every *assistance* within my power in the formation of the Mechanics' Institute of London."

The "original mechanics' class," alluded to by Dr. Birkbeck, was, as Lord Brougham is aware, a class which he had opened for the scientific instruction of mechanics, when Professor of the Andersonian Institution at Glasgow, and which is generally supposed to have been the first school of the kind established in Britain.

4. Mr. Robertson wrote the farther account, given in the Mechanics' Magazine, No. 9, October 25, of the progress made in the arrangements for holding a public meeting, to take the proposal for establishing the Institution into consideration.

5. The Mechanics' Magazine of Nov. 1, announced that the public meeting would take place on the 11th of November, and up to that period Mr. Robertson and Mr. Hodgskin were almost constantly occupied in conducting the correspondence to which the proposal for establishing the Institution had given rise, and in waiting personally on gentlemen, whose presence and assistance at the meeting were considered desirable.

6. On the 8th of November a preparatory meeting was held at the Crown and Anchor Tavern, of gentlemen friendly to the project, including *Mr. Brougham*, Dr. Birkbeck, Mr. Martineau, Mr. Richard Taylor, Mr. Sidney Taylor, Mr. Francis Place, &c., when Mr. Robertson submitted a series of resolutions which he had prepared for the public meeting, and the same were, after some slight modifications, unanimously approved of.

7. On Nov. 11, the public meeting was held, Dr. Birkbeck presided, and Mr. Robertson, with the assistance of Mr. Hodgskin and Mr. Place, managed the details. The resolutions prepared by Mr. Robertson, and approved of by the committee, were adopted by the meeting; the Institution was established, and a committee appointed to frame a code of laws for its government.

8. Mr. Robertson drew up the account of the proceedings of the public meeting, which occupies the whole of No. 12 of the Mechanics' Magazine, a copy of which Number *was, with other* memorabilia, deposited in *the foundation*-stone of the Theatre subsequently erected for the Mechanics' Institution in Southampton-buildings.

9. After many general and committee meetings, the conduct of which devolved chiefly on Mr. Robertson, a code of laws was framed and adopted, many hundred members enrolled, office-bearers appointed, and subscriptions to a large amount collected.

10. Mr. Francis Place (a friend of Mr. Hodgskin) drew up, at the joint request of Mr. Robertson and Mr. Hodgskin, a narrative of the proceedings connected with the foundation of the Institution. Mr. Place knew better than any other third party how far each had contributed to the good work, and it was not doubted would do equal justice to both. His narrative is prefixed to the code of laws, and will be found to confirm (as far as it could) all that has been now stated.

11. The first name subscribed to the code of laws is that of "J. C. Robertson;" the second, "Thomas Hodgskin;" and the third (Mr. Robertson thinks, but is not quite certain), "George Birkbeck."

12 and last. Feb. 20, 1824, Dr. Birkbeck delivered the Inaugural Address, in the course of which he made use of these words:—

"For myself, WHO ALTHOUGH NOT THE ORIGINATOR OF THIS INSTITUTION, took the earliest counsel with *its earliest effectual projectors*, I can boldly declare, that the scientific cultivation of the mind of the mechanic, was, and still continues to be, my only object. For my friends, Mr. Robertson and Mr. Hodgskin, your original temporary secretaries, *who first gave currency to the plan, and were the powerful means of organising our first public movements*, I can with equal confidence answer."*

Mr. Brougham was present at the delivery of this Address.

Shortly after these proceedings, there appeared in the Edinburgh Review, No. 82, an article on the "Scientific Education of the People," in which there was given an account of the establishment of the London Mechanics' Institution, which commenced in these terms:—"When Dr. Birkbeck re-

* Since Mr. Robertson forwarded to Lord Brougham the present explanation, he has found among his papers a note, which Dr. Birkbeck sent to him, along with the manuscript of his Inaugural Address for publication in the Mechanics' Magazine. It concludes in these terms:—"It gives me real satisfaction and pleasure to learn from yourself that I have done you and Mr. Hodgskin justice. I am sure that I have not said too much in your praise, and I hope *I am incapable of appropriating to myself* THAT WHICH I KNOW AND BELIEVE TO BELONG TO ANOTHER. Indeed, where such ample justice has been done to my exertions, I must have been left without excuse if I had acted differently. Believe me to be, with great regard, your sincere friend, GEORGE BIRKBECK."

flected on the success of his plan, both at Glasgow, and now since it was established in a place (Edinburgh) far less abounding in artisans, it is not to be wondered at that he should have conceived the idea of giving its principles a wider diffusion, by the only means which seem in this country calculated for the general circulation of any scheme—its being patronised in London. He, and a few of his friends, accordingly called the attention of the metropolis to it about the end of last year," &c. Dr. Birkbeck was here represented as the prime mover in the affair, and not the slightest mention was made of the real—"the earliest effectual projectors," and organizers of the Institution.

The authorship of this article being generally ascribed to Mr. Brougham, Mr. Robertson solicited and obtained an interview with that gentleman, when he respectfully represented to him the inaccuracy of the account which it gave of the origin of the London Mechanics' Institution—reminded Mr. Brougham what he had heard Dr. Birkbeck state on the subject in his Inaugural Address—and pointed out most particularly to his attention that so far from Dr. Birkbeck having originated the movement in the metropolis, he had been resident in London for many years without having ever of himself taken one step to promote the establishment there of a school for the scientific instruction of mechanics, similar to that which he had founded at Glasgow. Mr. Brougham readily admitted that he was the author of the article; but accounted for its inaccuracies by saying, that it had been so altered by the people at Edinburgh, that he hardly knew it again when he saw it in print. He observed, however, that he was about revising it for publication in a separate form, when "all should be set right."

The article did appear soon after in the shape of "Practical Remarks on the Education of the People;" but all was *not* "set right." It contained a very flattering (far too flattering) notice of Mr. Robertson, as the Editor of the Mechanics' Magazine; but no recognition whatever of the prominent share which that publication and its Editor had in the establishment of the Mechanics' Institution.

In the Edinburgh Review for Oct., 1825, there appeared another article on Mechanics' Institutions, which was generally said, and Mr. Robertson believes, to have been also from Mr. Brougham's pen. In speaking of the progress made by the Mechanics' Institutions, the writer observes:—"Meanwhile, the establishment in London has flourished beyond the most sanguine expectations of its most enlightened supporters. The foundation of the *Theatre* was laid about Christmas (1824), and on the 8th of July it was completed, and opened by *the distinguished founder*." Any one would suppose, from these words, that the writer intended again to represent Dr. Birkbeck as the founder of the *Institution*, but it appeared that there was hidden under them a literal meaning of quite a different import; for, before quitting the subject, the writer afterwards adds: "We have called Dr. Birkbeck the founder *of this building*; and well we may. for he advanced the money (several thousand pounds) which purchased the house and erected the Theatre." The introduction of this qualifying and restricting sentence—even though at the latest and in a way not remarkable for its candour and ingenuousness, since it left the better half of the truth untold—may suffice to show that the author was (by this time at least) perfectly aware that Dr. Birkbeck was *not* the founder of the *Institution*.

On the 5th of June, 1828, the foundation of the London Mechanics' Institution was celebrated by a public dinner at the Freemasons' Tavern. Mr. Robertson was not present at this dinner, but Mr. Brougham, who was, was reported by the newspapers to have proposed the health of Dr. Birkbeck, as "*the Founder* of their great, flourishing, and, he hoped, perpetual *Institution*." After all that had passed, this seemed to Mr. Robertson not a little astonishing; and in the next following Number of the Mechanics' Magazine, he thus remarked on the subject:—

"We shall not trust ourselves to give expression to the feelings which the pretensions thus set up have excited, but simply recall to the notice of our readers what both Mr. Brougham and Dr. Birkbeck have themselves said on former occasions, and leave every impartial mind to judge for itself, how far they have done fairly on the present."

Mr. Robertson then quoted the language made use of by Dr. Birkbeck in his Inaugural Address, and by Mr. Brougham in the second article in the Edinburgh Review (assuming it to be written by him), and put to the latter the following questions:—

"Will Mr. Brougham explain how it happens that the gentleman who, in 1825, he described as being merely the founder of the *Theatre*, and on the ground merely of his having advanced the money to build it (on the security, it should have been added, of the building, and at four and a half per cent. interest), has been toasted by him, in 1828, as the FOUNDER of the Institution? Can the lapse of two or three years have changed a matter of fact, or extinguished entirely the personal knowledge which Mr. Brougham once possessed of all the circumstances attending the foundation of the Institution?"

Mr. Robertson sent to Mr. Brougham a copy of the No. of the Mechanics' Magazine containing these remarks and questions.

Mr. Robertson also addressed a letter to the newspapers, pointing out the historical error involved in the terms of the toast; and this letter appeared in the *Times*, and several other prints of less note.

On the 4th Dec., 1829, there was another celebration of the foundation of the London Mechanics' Institution, at which Mr. Brougham once more represented Dr. Birkbeck to be "the *Founder* of the Institution."

Once more, therefore, Mr. Robertson was under the necessity of protesting against the extraordinary course of conduct pursued by Mr. Brougham on this head—not only in his own Magazine, but through the medium of the newspapers.

Mr. Robertson has now brought to a close the explanation desired by Lord Brougham, and he submits that he has proved very clearly—

1st. That Dr. Birkbeck was *not* the founder of the London Mechanics' Institution.

2d. That Lord Brougham was a party to proceedings inconsistent with the supposition of Dr. Birkbeck being the founder.

3d. That it has been represented to Lord Brougham again and again, and in every way most likely to impress the fact on his Lordship's mind, that it was doing a violence to truth to persist in ascribing the foundation of the Institution to Dr. Birkbeck.

And 4th. That Lord Brougham must, therefore, be under an entire mistake in now stating, that he "always understood Dr. Birkbeck to be the founder of the Institution, and never heard of any other."

23, Soley-terrace, March 10, 1835.

Mr. Robertson to Lord Brougham.

Mr. Robertson presents his respectful compliments to Lord Brougham. Mr. Robertson addressed a note to Lord Brougham on the 10th inst., furnishing, agreeably to a request from his Lordship, an explanation of the meaning of a paragraph which appeared in the Mechanics' Magazine of the 7th, animadverting on certain statements made by his Lordship respecting the foundation of the London Mechanics' Institution, and the spread of similar institutions in England. Mr. Robertson has not been without an expectation that he would have heard from his Lordship on the subject of that explanation. Either Lord Brougham has done great injustice to Mr. Robertson, or Mr. Robertson has blamed Lord Brougham most *undeservedly; and in either case the matter ought not to rest where it is.* Mr. Robertson will not presume to suggest what it would be proper for his Lordship to do on the former supposition; but he must say for himself, that if it could be shown that he has misrepresented his Lordship in the slightest particular, he would feel it to be his duty to make instantly every reparation in his power, and should have great pleasure in doing so. Mr. Robertson will wait till Thursday next for any communication with which Lord Brougham may be pleased to favour him; and in the event of his not hearing from his Lordship, will then consider himself at liberty to lay this correspondence as it stands before the public.

6, Peterborough-court, March 17, 1835.

Lord Brougham to Mr. Robertson.

Lord Brougham's compliments to Mr. Robertson, and he has received his letter, in which there is something like a threat of publishing what he calls "this correspondence," to which Lord Brougham can have no objection whatever. But he begs it may be recollected that it was not begun by him. All he did was to ask from the publisher of the Mechanics' Magazine what a statement meant or referred to, which had been sent to him, and to which his attention was called, by being particularly scored with ink. He has since read the full statement in writing, and also, in a former number of the same work, sent him by Mr. Robertson, of almost all the particulars of which he had no recollection whatever, when the first communication was made to him. Nor does he even now recollect several of them.

Lord Brougham can have no possible interest, personally, in the controversy, except to do justice to the parties as far as lies in his power. He is very far from wishing, and, he dares to say, so is Dr. Birkbeck, to deny Mr. Robertson and Mr. Hodgskin (the latter of whom he has the pleasure of knowing) the share of merit that belongs to them, in the important suggestion which they made, and in the part which they took in the proceedings of 1824 and 1825. He always has thought, however, and he still thinks, that to Dr. Birkbeck belongs the praise of first establishing Mechanics' Institutions. The foundation of them was distinctly traced by Lord Brougham, at the late meeting, to the Doctor's proceedings at Glasgow five-and-thirty years ago; and he dwelt especially on the testimony then given by the workmen themselves, and the record of which he had seen under their own hands. He also dwelt on the munificent conduct of Dr. Birkbeck, by which the London Institution was established. Whether considering these circum-

stances, and all the others connected with the subject, and not denied by Mr. Robertson, Dr. Birkbeck or he is to be regarded as the person to whom the country owes the benefits of those institutions, is a question on which every one may form his opinion, and Lord Brougham presumes that he too may form his own. He can have no wish except to arrive at the true merits of the question.

Berkeley-square,
Wednesday Morning, March 18.

Mr. Robertson to Lord Brougham.

Mr. Robertson presents his compliments to Lord Brougham, and must distinctly disclaim having made use of any thing "like a threat" in his last note to his Lordship, or any words that will fairly bear such a construction. When he spoke of publishing, it was of publishing as a measure which he had contemplated and resolved upon from the first, and not as one that it was in Lord Brougham's power, by any thing he could do, to prevent. In saying that, if he did not hear from his Lordship by Thursday, he would "consider himself at liberty to lay this correspondence, *as it stands*, before the public;" he meant evidently to hint to Lord Brougham that, if published *as it then stood*, after sufficient time had been allowed to his Lordship to ascertain the correctness of the statements contained in Mr. R.'s note of the 10th, and on which Mr. R. grounds his charge of misrepresentation against his Lordship, the public would naturally infer, and be entitled to infer, from his Lordship's silence, that Mr. R. had stated nothing but the truth. Mr. R. acted but as a spirit of fairness dictated, in giving Lord B. that intimation, and little expected to see it twisted into such a breach of decorum as his Lordship now so handsomely imputes to him.

Lord B. seems not to approve of the term "correspondence," as employed on the present occasion, and expresses an anxiety to have it recollected that, at all events, "it was not begun by him." Mr. R. is rather surprised that his Lordship should stand upon such trifles, when there are matters so much more serious between them to settle; but since his Lordship deems them not beneath the dignity of discussion, Mr. R. may be excused for stopping to observe, that the facts of the case are against his Lordship on both points, The *first* letter of the series is one from Lord B., demanding an explanation; the *second* one from Mr. R., giving the explanation demanded; and these two letters, had there been no others, would of themselves have sufficed to constitute "a correspondence."

Lord Brougham states, that "of almost all the particulars," contained in Mr. Robertson's letter of the 10th, "he had *no recollection* whatever," when he asserted, in his note of the 7th, that "he had always understood Dr. Birkbeck to be the founder of the London Mechanics' Institution, and had never heard of any other;" and, his Lordship adds, "nor does he even now *recollect* several of them." Mr. R. submits that it would have been only fair in his Lordship to specify those particulars which were in his recollection and those which were not — those which he can "now recollect" and those which he cannot—in order that Mr. Robertson might have an opportunity of refreshing his Lordship's memory (if in his power) on those points where it fails his Lordship; and also in order that it might be seen how far that which his Lordship did and does recollect, is consistent with those statements of which Mr. Robertson now complains.

Lord Brougham need scarcely be reminded that after all, the reliance to be placed on "*non mi ricordo*" evidence is exceedingly small. A single positive denial would have been worth a whole host of non-recollections; but his Lordship ventures on nothing of the kind. It matters little what his Lordship may not choose to admit, as long as his Lordship does not and cannot deny these main points:—1. That he "heard" Dr. Birkbeck state, in his Inaugural Address, that he was "NOT THE ORIGINATOR" of the London Mechanics' Institution. 2. That his Lordship, almost immediately after, wrote the article in the Edinburgh Review, giving a directly different account of the origin of the Institution. 3. That his Lordship, after being remonstrated with, wrote that other candid and magnanimous article in the Edinburgh Review, substituting the word *building* for *institution*. 4. That after some further lapse of time, his Lordship reverted to his original mis-statement, and toasted Dr. Birkbeck at a public dinner as the founder of the *Institution*. And 5. That Mr. Robertson has warned his Lordship again and again, privately as well as publicly, that he was persisting in an offence against truth, which would one day or other make itself heard to his confusion.

While such are among the undeniable facts of the case, there can be no question among honourable men, that Lord Brougham has much to retract and to apologize for; but it would seem, from Lord Brougham's last note, that he does not consider it becoming in him to do either the one or the other.

Lord Brougham states that "he is very far from wishing, and he dares to say so is Dr. Birkbeck, to deny Mr. Robertson and Mr.

Hodgskin the share of merit which belongs to them."

Of the sincerity of Lord Brougham's wishes in this respect, his actions are a striking illustration. Of Dr. Birkbeck's, no better proof can be desired than the fact, that he was chairman at the dinner at which Lord Brougham toasted him as "the founder of the Institution;" and returned thanks for the compliment, without making the slightest objection to it on the score of its utter want of truth.

Lord Brougham says, "that he always has thought, and he still thinks, that to Dr. Birkbeck belongs the praise of first establishing Mechanics' Institutions." Lord Brougham knows well that this is not the point in dispute, on the present occasion. What his Lordship has asserted is, that it was Dr. Birkbeck who gave rise to such Institutions *in England*, by founding that in the metropolis; and this assertion it is which Mr. Robertson contests, and challenges his Lordship to make good.

Lord Brougham is pleased to remind Mr. Robertson of the "*munificent* conduct of Dr. Birkbeck, by which the London Institution was *established*." Mr. Robertson must confess that he is at a loss to perceive where the munificence lay in advancing between 3,000*l.* and 4,000*l.* on a mortgage of buildings worth far more than the sum, at a rate of interest (4½ per cent.) *above* the market rate at the time. Nor was it by means of Dr. Birkbeck's money that the Institution was "*established*." The Institution was established November 11, 1823, and the Theatre, built with Dr. Birkbeck's money, was not opened till July 12, 1825.

Lord Brougham observes, that whether "Dr. Birkbeck, or he (Mr. Robertson), is to be regarded as the person to whom the country owes the benefits of these Institutions, is a question on which every one may form his opinion;" and "Lord Brougham presumes that he too many entertain his own." Mr. Robertson does not dispute Lord Brougham's right to entertain any opinion on the subject he pleases; but he does dispute his Lordship's right to seek to influence the opinions of others by the circulation of statements at variance with truth.

With respect to the "benefits" which the country owes to Mechanics' Institutions, Mr. Robertson would be acting inconsistently with the opinions he has been in the habit of expressing on the subject during the last eight years, were he to leave it to be supposed that he shares in the exultation with which his Lordship seems to contemplate them. Mr. Robertson believes it will be found, on the most rigid inquiry that can be made, that considered as *Mechanics'* Institutions — as establishments for the scientific instruction of *mechanics*—they have, so far as regards England, very generally failed. They are, with but two or three exceptions, *Mechanics'* Institutions in name only; the great majority of the members consisting every where of persons who are *not* mechanics. In the metropolis this is so especially true, that of the thousand members and upwards belonging to the London *Mechanics'* Institution, there are, notoriously not more than a hundred or two who are *mechanics*, and that out of a population embracing at least 100,000 persons of that class. Of the several suburban *Mechanics'* Institutions, too, which were founded in imitation of the parent establishment, there is not one which can be referred to for evidence of any greater success; some of them have dropped the title "Mechanics," and assumed others more suited to their actual character, while not a few have disappeared altogether.

The cause of all this it is not difficult to trace. The *mechanics* of England have kept aloof from these institutions, not because they are insensible to the benefits to be derived from scientific instruction (of which abundant proofs might be adduced), but because their intellectual wants have not, in any one of them, been sufficiently consulted —in many of them not at all. The plan has generally been to act without any plan whatever—to run through all the arts and sciences, but in every possible variety of order, with the single exception of not beginning at the beginning; or, what is still worse, to snatch at any thing that offered in the shape of a course of lectures, no matter on what subject.

The responsibility for this state of things rests, of course, with the persons who have taken the lead in the direction of these institutions, and with none more than Lord Brougham and his friend Dr. Birkbeck. Had a systematic course of instruction, judiciously suited to the wants of mechanics, been adopted at the metropolitan institution, it would have served as a model for the other institutions of a similar kind throughout the country; the mechanics of London would have as generally supported it, as they have generally repudiated it; and their example would have been followed no less generally by their brethren in other parts. But as it is, the very defective character of this institution has been the great cause that so many defective institutions have arisen around it; its failure has caused the failure of a hundred others. From the position Dr. Birkbeck occupied in the institution, he had it undoubtedly in his power to make it what he pleased; but content with the degree of notoriety which the Presidency conferred upon him, and secure in the hold

which *his bond* gave him upon the chair, he never made any serious effort to render it what it might and ought to have been. Nay, more, when he saw his passive and systemless system of management producing its natural fruit—the general desertion of the institution by its natural supporters, the mechanics of London (for at *first* the members were nearly all mechanics), rather than confess so disagreeable a truth, he kept assuring every body that it was "flourishing" beyond all expectation, although, as a *Mechanics'* Institution, it was, in point of fact, all but extinct. Lord Brougham, too, though not unwarned of the real state of matters, chose to lend the high sanction of his authority to Dr. Birkbeck's delusive statements; and the public at large, confiding in his Lordship's authority, have remained, even to the present day, under a very general impression that the success of Mechanics' Institutions has been such as to satisfy every just and reasonable expectation.

Mr. Robertson begs, emphatically, to assure Lord Brougham, that it is not because he sees any reason to be proud of the benefits which Mechanics' Institutions have hitherto conferred on the mechanics of England, that he has been solicitous to reclaim for himself and his Journal the honour of having originated them in this part of the kingdom; but because he is not without hope that, when the public are made fully aware of the hollow pretensions, and injurious proceedings, of those who have arrogated that honour for themselves and their friends, measures may yet be taken to reap from this scheme of popular instruction all the good which it is so eminently calculated to produce.

6, Peterborough-court,
March 19, 1835.

"CREDIT PERNICIOUS."

Sir,—I have refrained, until the bill for abolishing imprisonment for debt should come again under discussion, from doing myself the pleasure of stating that Mr. M'Culloch's opinion on the subject of useless credit is exactly in unison with my own, expressed in a short pamphlet, which was noticed by you in your Magazine of the 15th March last. Mr. M'Culloch does me the favour to append to the article "Credit," in his Dictionary of commerce, the following note:—"When the former edition of this work was published, we were not aware that it had been previously proposed to take away all action for debts under 50*l.* or 100*l.*; but we have since met with a pamphlet, entitled 'Credit Pernicious,' published in 1823, in which *this plan is proposed*, and ably supported." As your expressed opinion on the subject, though most kindly expressed, was not in unison with mine, I am glad to let your readers know, at this suitable juncture, that if I am in error, I err with one whose opinions are entitled to great consideration, whatever mine may be.

I am, Sir,

Your obedient servant,

ARCHIBALD ROSSER.

15, New Boswell-court, Lincoln's-inn,
March 11, 1835.

NOTES AND NOTICES.

The Greenwich Railway will certainly not be ready to take passengers to the fair on Easter Monday, although, according to some sanguine expectants, it was to be ready for that purpose two years ago. It is still progressing, however, and some of its arches have now made their appearance at the London bridge end of the line, close to Tooley-street. It is understood that a locomotive engine will ply at Easter, for the conveyance of passengers on that part already completed; of course, such a trip will be taken more for the gratification of curiosity than for the sake of utility. A plan has also been broached for erecting a landing place for steamers at Deptford, in connexion with the railway. Nothing but capital is wanting to reduce the scheme to practice forthwith. The success of such a speculation, however, is rather problematical. In nearly the same time that it would take steam-vessel passengers to land at Deptford, and get seated "all right" in the railway carriages, they might, by going on in the steamer, be at the end of their voyage; and could the transference be effected with even instantaneous rapidity, the railway carriages could not land passengers in the city, as the steamers now do, but in Tooley-street, Southwark, a good quarter of a mile distant.

The proprietors of the Adelaide-street Gallery have obtained a charter from the Crown, incorporating them under the title of "the Society for the Illustration of and Encouragement of Practical Science."

Perpetual Motion.—The *Gazette Piemontaise* states that M. Jacobi, of Konigsberg, has succeeded in obtaining perpetual motion, simply by means of electro-magnetic influence.

Caoutchouc Solvent.—The Messrs. Enderby, of London, have lately obtained, from the destructive distillation of caoutchouc, a fluid of great volatility, which is stated to possess, in a higher degree than any other menstruum, the property of dissolving this valuable substance.

The Sun's Rays.—From a series of experiments made in Switzerland, by Professor Forbes, and detailed by him in a communication to the Royal Society of Edinburgh, it appears that the intensity of the sun's rays is diminished not less than one fifth by passing through vertical columns of air, varying from 5,000 to 7,000 feet.

Progress of Improvement in the City.—The new line of street from Moorgate to Lothbury, which will complete the junction between London Bridge and the City-road, is at length being proceeded with most vigorously. Numbers of houses are already pulled down, and many more have been begun upon, at both ends, and along the line, making tremendous havoc among the wretched rookeries of

courts and alleys a little to the east of Coleman-street. The Lothbury end of the new street will not come out exactly opposite to Princes-street, if we may judge by the houses already demolished to make room for it,—but partly facing the well-known rounded corner of the Bank, for which Sir John Soane is generally allowed so much credit; and the Bank will apparently be called upon to give up a part of their territory, at present only a piece of green sward, surrounded by iron railings, for the benefit of the public. After all, it may admit of question whether the chief part of Coleman-street might not have been advantageously retained as a portion of the new line. The demolition of a few houses at the Lothbury corner would have conducted Princes-street directly into it; and if the upper part, which at present bends to the westward, had been straightened, a few houses at Moorgate pulled down, and the range of the new buildings on the Pavement inclined a little to meet that end (which might easily have been done but a few months back), a line would have been accomplished, nearly as direct as the present—intended—one, and at not one-tenth of the expense. * * It is said that the whole length of Thames-street is to be widened forthwith, by taking down and setting back all the houses and warehouses on the north side, to a distance of several yards. If so, the most characteristic "bit" of business-like indifference to convenience in all London will be destroyed.—F. H.

British Enterprise.—It appears from the registry kept at the priory of Chamonix, that the number of ascents to the top of Mont Blanc, the loftiest summit in Europe, has not exceeded twenty; and that of these two were attempted by Swiss, two by Americans, one by a German, one by a Pole, one by a Savoyard, one by a Courlander, *and twelve by British travellers.*—F. H.

The Rival Cattle Markets.—The City has received an unexpected rebuff in the proposed enlargement of Smithfield, by the rejection of the bill for that purpose, with an immense majority, in the House of Commons. The Common Council have again resolved to oppose the Islington Market Bill, to obtain which (toll clauses included) the most strenuous exertions are being made by the proprietor and his friends.

Quantity of Solid Matter carried by Rivers into the Sea.—Mr. Leonard Horner made lately some experiments on the quantity of solid matter suspended in the waters of the Rhine, from which he calculates (Edinburgh Philosophical Journal, Jan. 1835,) that that river carries down 145,980 cubic feet every 24 hours—a mass greater in bulk than a solid tower of masonry, 60 feet square and 40 feet high. If we multiply 145,980 by 365, we have 1,973,433 cubic *yards* carried down in the year; and if this process has been going on at the same scale for the last 2,000 years—and there is no evidence that the river has undergone any material change—then the Rhine must in that time have carried down materials sufficient to form a stratum of stone of a yard thick, extending over an area of more than 36 miles square.

The Short Passage to India.—The report of the arrival of the "Forbes," some time ago, seems to have been without foundation. Singularly enough, all the attempts from the Indian side have hitherto come to nothing. Our home government have, however, taken up the idea with so much spirit, that a better result may be confidently anticipated for their efforts. Captain Chesney is by this time far on his way towards the Euphrates, on his experimental voyage—his expedition having now left *Liverpool for some weeks*; and notices have been *issued from the Post-office*, that letters will for the *future be received* for transmission to India, *via Alexandria, arrangements* having been entered into for that purpose, and steamers appointed for that service. A number of new steam-vessels, on a rather novel construction, are said to be building expressly for the conveyance of the Indian mail by the Mediterranean. We doubt, however, whether they will be as well prepared, especially at first, to perform their half of the voyage; but the news of the spirited manner in which the subject has been taken up in England, will, of course, give fresh vigour to the supporters of the plan in India.—F.H.

Zoological Gardens bid fair to become regular appendages to all large towns. In addition to the two metropolitan establishments (the Regent's-park and the Surrey), there are now others at Dublin, at Edinburgh, at Brighton, and at Liverpool (the latter peopled by the former denizens of Atkins' well-known wild beast show, now for the first time a fixture)—and a project is on foot for another at Bristol. Exeter Change and travelling menageries will soon be only matters of history. As for the royal beasts in the Tower, they have long since migrated to the West-end, and become incorporated with the Zoological Society's collection in the Regent's-park.—F. H.

The First Steam-Press.—At a sale by auction, last week, in Fleet-street, the "Royal George" steam printing-machine, which was the first ever erected in this country, or in the world, was knocked down for thirty-four pounds—*sic transit gloria mundi!* Although in substance the original machine, it had received all the successive improvements made in printing machinery since it was first set up.

Unimportance of an "Important Engine."—The Chinese are awarded by most people the honour of the invention of printing, but they cannot, at any rate, lay claim to that of the printing *press*; simply because they do not make use of any. Chinese press-work (so to speak) is executed by hand, the ink being laid on with a soft brush, and the impression taken by means of another brush, or a kind of soft rubber. The Chinese print only on one side, their paper being very fine and thin, so that the characters would show through. When bound, two leaves always go together, so that a Chinese volume is sure to present, at any time, the appearance of a fine "uncut copy."—F. H.

Mr. Aldersey in our next.

Communications received from Mr. Badnall (in reply to Mr. Whitehead and Mr. Stephenson)—Mr. Cunningham—Mr. Baddeley—Mr. Thomas—Captain Ballingall—Mr. Ford—Mr. Holland.

The Supplement to Vol. XXI., with a Portrait, on Steel, of the late Mr. Telford, continues on sale, Price 6*d.*; also the Volume complete, in boards, Price 8*s.*

☞ The Editor of the Mechanics' Magazine has made such arrangements as enable him to offer, on unusually advantageous terms, to undertake the solicitation of Patents for New Inventions, the drawing and revising of Specifications, and generally every other branch of Patent business. Drawings of Machines executed with accuracy and dispatch.

6, Peterborough-court, Jan. 3, 1835.

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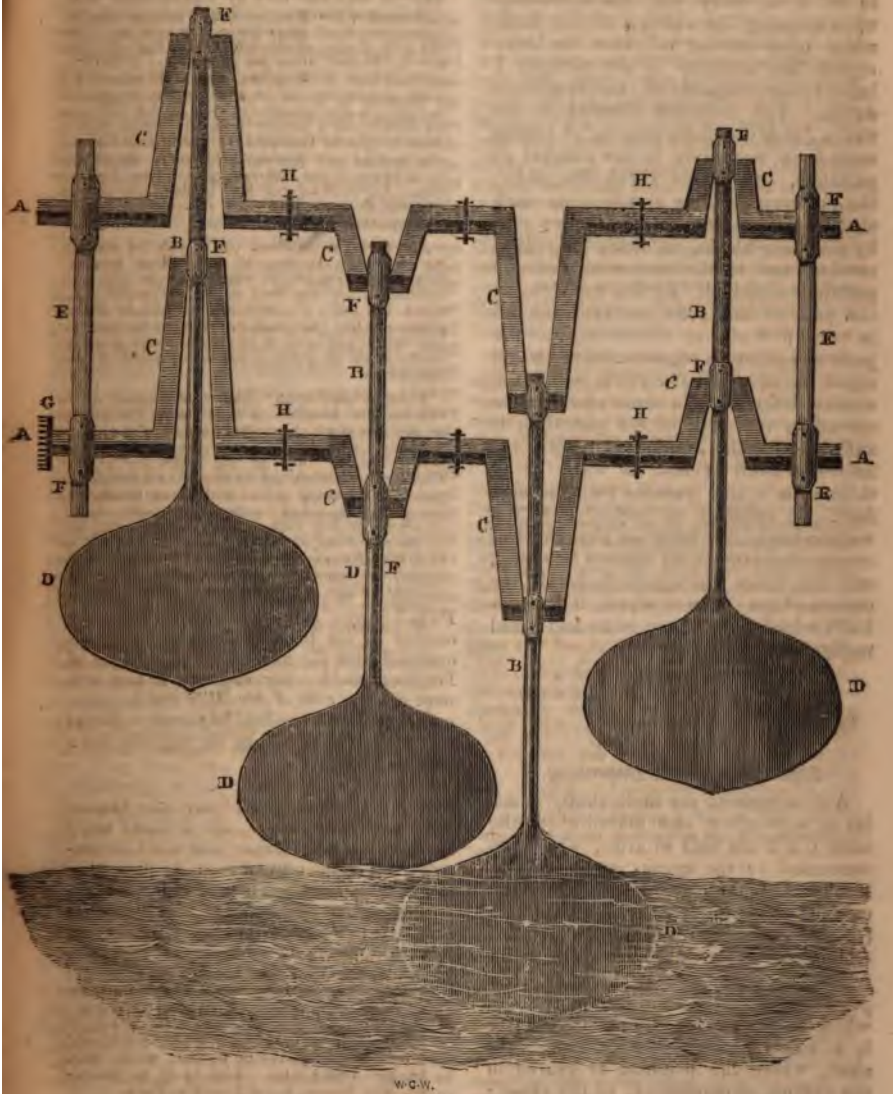


MR. M'CURDY'S PROPELLER.

Sir,—Having noticed in your instructive Magazine a great number of water-wheels, I take the liberty of enclosing you a drawing of a propeller, which has the merits at least of being *unique* as well as *simple*. The great object appears to be to do away with the *concussion* upon entering the water, and the *back-water* upon leaving it. How far these objects are obtained by my method, I leave to the judgment of your readers to decide. The invention consists of two shafts (with the same number of cranks upon each, according to the number of paddles), one placed above the other; the two corresponding cranks upon each shaft are connected to the arms or rods by plummer-blocks, in which the cranks revolve, and to the bottom of each the paddle is attached. By this combination the paddles and rods are kept vertical in every part of their revolution, and the paddles perform a segment in the water equal to one half the circle which the cranks describe. No more space is required in the stern of the boat than is sufficient for the cranks to revolve. It leaves no swell behind, its water being thrown in a line parallel with the surface. It requires no cover, like the water-wheel, and from its cheapness of construction, the small space it occupies, and its entire exemption from all the defects of the common wheel, it is peculiarly adapted to steam-boats and canal navigation.

Your obedient servant,
JOHN M'CURDY.

Bedford-hotel, Southampton-row,
Feb. 24, 1835.

Description of the Engraving.

A A represents the main shafts, similar to each other, one placed above the other; B B the rods or arms, which are connected to the cranks by plummer-blocks; C C the cranks, with a bearing on each at the point F; D D the paddle (of the South Sea form) at the lower end of the rods; E E the timber upon which the shafts rest at the ends upon plummer-blocks; F F the plummer-blocks which attach the arms to the cranks; G is a wheel at the point of the lower shaft, where the machine is geared to *the engine*, or machinery, in the vessel; *H H the flanges* with bolts that unites *the cranks*, should they be made single

FORRESTER'S PLANETARIUM.

Sir,—Averse as I am to occupy your pages with communications of a controversial nature, yet I cannot refrain from noticing Mr. Henderson's letter, p. 199, purporting to be a reply to the description of my improved planetarium, inserted in No. 587.

Mr. H. sets out first by stating that the wheel-work of "Henderson's Planetarium," described in No. 500, was no calculation of his—it was not invented by him! I was inclined at first to think that, like the scene in the Comedy of Errors, another Mr. Henderson, fearful that this exactest of simple machines might be imputed to him, had risen up to disown it. But, no! it really appears that "Henderson's Planetarium," that machine which he tells us, in No. 500, was of his own construction, and where he gives us a specimen of the manner by which the numbers HE *had taken* may be calculated, is *not* Henderson's, after all! Who, then, does it belong to? Mr. H. now ascribes it to Mr. Ferguson; but the manes of Ferguson stalks forth, and claims to be vindicated from the imputation! This ingenious, and, I may add, equally *ingenuous* philosopher states in the work referred to, that the motions were designed for a clock, and that he had seen them in a printed book, but so faulty were the numbers of Mars and Saturn that he was obliged to alter them. In Mr. H.'s *ex*-machine Saturn has, however, undergone *another* alteration, which has "improved it very much the wrong way," by substituting *double* the number of wheels, and *fourteen* times the amount of error! Neither is Uranus (nor *Pallas*) found here—not having been discovered in his time. Indeed, any one acquainted with the mechanical productions of Ferguson could easily divine that this was none of his. Out of Mr. H.'s *ten* motions, only *four* are to be found in the work he has referred to, to show that his numbers have been long known!

Mr. H. says he is at a loss to perceive in what the improvement of my planetarium consists. It may be so. But I hope I made it clear to every one else, that *one* improvement, at least, consisted in its possessing almost *forty times* greater accuracy than Mr. H.'s quondam planetarium. But Mr. H. says more; he charges me, too, with bringing forward a machine avowedly as my own, whose wheel-work was known of old. Of this, however, he offers no proof. Let Mr. H. produce those *old* chronicles in which he says my arrangement of the wheel-work of Saturn and *Uranus* is to be found; and I will be happy to find I have been anticipated by such venerable authorities. I trust to be in the mean time believed when I state, that it is of my own calculation, unaided even by a

tooth being added from the hint of any turer.

granting that the wheel-work of my trium were of ancient date, I leave your to judge of the quackery of pretend- t he had constructed a machine whose s were shown "as *nearly as possible* ngle wheel-work," yet conscious all the on his own showing, that planetariums m of old" could be constructed with *simplicity*, and forty times more exact! laring absurdity is attempted to be pal- by the subterfuge, that such an amount r might perhaps arise from comparing iods of the one with solar, and the other dereal time. Mr. H. could *easily* have d himself on this subject, for Jupiter's has the *same* wheels in *both* instru- and the errors are stated the *same*.

Mr. H., notwithstanding his statement last letter, may now inform us that he t know these accurate motions "of let us examine what we are certain he ow. In the same work of Ferguson's hich he took the wheel-work of four of otions, and which, therefore, he *must* een, the wheels 7 and 206 are given for , being within 1 day 21½ hours of the yet in this *exactest* of *single*-wheeled ariums, Mr. H. employs *four* wheels, a endless screw, with an error of 27 21 *hours!* I own I was somewhat at a r the motives of his extraordinary mutation, when a single passage in his tter explained it:—"It (his planet-) was made entirely of *wood*"—which, rse was, to him, a sufficient reason for ploying a wheel of 206, driven by a of 7. But why, then, attempt to foist the public as the correctest possible? lso was explained by another passage in mer communication:—"Persons wish- have models of such a planetarium, ave them from a friend of mine, by ation to me, for 5*l*. 10*s*."

conclusion, Mr. Editor, permit me to you for your ready insertion of my for- ommunication, and for your attention ring the isometrical view of my ma- as well as a section; and likewise to ise for my apparent neglect in not g this sooner; but I only received the for December the beginning of this ; and not being in possession of the referred to by Mr. H., I delayed writ- ill I could get an opportunity of ex- ing it.

I remain, yours respectfully,

WILLIAM W. FORRESTER.

ealdy, Feb. 27, 1835.

RIVAL PATRONS OF SCIENCE.

House of Commons, March 16, 1835.

In reply to a question from Mr. Spring Rice, respecting the pension recently granted to Professor Airy,

Sir Robert Peel stated, that he had not the honour of a personal acquaintance with Professor Airy, but having the highest respect for the position which he occupied, not only in this country, but in Europe, he had written to him, saying, that he should have great gratification in recommending him to his Majesty for a pension, to be charged on the civil list, for his life, for the purpose of enabling him to pursue those high scientific studies which had been so useful to his country, and so creditable to himself. He had informed Professor Airy that, in accepting that pension he would incur no personal or political obligation; and he was happy to acquaint the House that he had obtained Professor Airy's assent to the pension on the terms he had proposed.

Mr. Spring Rice was sure there was not any man, either in or out of the House, who would not feel pleasure in hearing the statement just made. The pursuits of high science were any thing but profitable, in a pecuniary point of view, to those who undertook them; and it would have been a matter of deep regret had not the merits of Professor Airy been noticed as they had been by the Right Hon. Baronet. His predecessors in the Government had reason to envy the Right Hon. Baronet the gratification which he must have derived from bestowing this mark of respect upon Professor Airy. He could, however, inform the House, that his noble friend lately at the head of the Treasury had had his attention turned to the meritorious services of the Professor. He held in his hand the copy of a letter which he (Mr. S. Rice) had addressed, by the authority of Lord Melbourne, to Professor Airy, in which he spoke of a contingent vacancy in the situation of Astronomer-Royal at Greenwich, and had proffered that situation to him as a reward for his scientific labours.

The following is the letter referred to in Mr. Spring Rice's speech:—

Downing-street, Aug. 25, 1834.

My dear Sir,—It is highly probable that a vacancy may take place very shortly in the office of Astronomer-Royal. If this event occur, it will of course be the duty and the object of the Government to make such a selection as shall be most conducive to the interest of science, and as shall secure to our national astronomical establishment, and its

observations, the greatest respect and authority throughout Europe.

On these principles it is more than natural that the Government should be desirous of knowing whether the appointment is one which you would accept; as it would be most gratifying to us all to have an opportunity of marking the admiration which we feel for your eminent attainments, and the respect which is justly due to your character as an individual. As a Cambridge man, I am fully aware that to our University the loss of one of its brightest ornaments cannot but be felt as irreparable: but we ought not to be selfish —we should think of England as well as Cambridge; and I trust there is not one of our scientific friends who will not feel, that in selecting a new Astronomer-Royal, it is towards you that the earliest attention of his Majesty's Government should be directed, not less in justice to science than to the civil credit and character of the country.

Pray let me hear from you at your earliest convenience, and believe me, Sir, &c. &c.

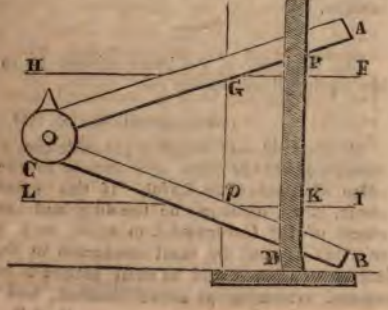
SPRING RICE.

To the Rev. Professor Airy.

SIMPLE PERSPECTIVE DELINEATOR.

Sir,—It is a considerable time since I discovered, and reduced to practice, a ready method of putting plans into perspective, without drawing the usual lines, without finding vanishing points, and without any other trouble than using a very simple instrument with a little care. The following is a representation of the instrument, which is cheap, and is sold by the author.

Let A C B be a variable angle, to move in every position; H F a line for the plane of the picture; and L I a ground line parallel to it; other lines, parallel to the last, may be drawn for different elevations. Let P be any point whose perspective is required; place C A at P, and also a T square, whose side is P D.; this done, move the leg C B until the line, I K, falls in the angle P K B: now move the T square into the position G p, so that the line G F comes into the angle A G p; then the point p, so found, will be the perspective of P. The principle upon which the instrument is constructed is, that the elements of perspective depend solely upon similar triangles.



In the year 1821, I invented and made public that description of horizontal perspective called by me the Horizontorium. The demand for it was such that it was sent for from all parts, and continued in request for four years. Very recently this very invention has been reproduced, by persons who would fain persuade the public that it has just come from France. Some have done even worse than this, for they have published new ones on false principles, and painted them in a manner which is a disgrace to science; any person desirous of seeing a specimen of this has only to look in at the Pantheon, in Oxford-street. The horizontorium has nothing beyond common about it; the only peculiarity being that the view is projected on a horizontal plane, in lieu of a vertical one. One eye only should view the picture, and that eye be guided by a hole in a card. The same should be done in viewing every perspective representation, let its plane of projection be in whatever position it may.

I am, &c.

W. SHIRES,
Mathematical Tutor.

AXLETREES—BIRCH ROD'S LAST REPLY TO JUNIUS REDIVIVUS.

Sir,—I agree with Junius that the readers of the Mechanics' Magazine are the likely ones to be sick of our controversy on the merits of Mr. Birch's axle, and for this reason I had hoped that it would not have been necessary for me to have said more on the subject; but he seems rather to prefer evading the principal point at issue (which I shall show anon), than to allow his letter of the 31st of January to be in a "subdued tone."

It would be intruding too much upon the patience of your readers, and a waste of more time than I can well spare, to notice in detail all the truisms which he

has laboured to prove, or to notice his comments on parts of my former letters, which have perverted their original meanings; but I cannot help noticing one or two of his remarks before proceeding to the more important parts of his letter.

He says I am mistaken if I suppose the extra size of the nave the only disadvantage, for "an axle-box, properly fitted to its arm, should have just so much lateral play, or freedom from contact, as will allow the capillary passage of oil when in motion." Right; but Birch's boxes have this lateral play.

Again—"Have the barrels a washer? If not, they will be noisy." Does Junius walk out with a hat on? If not, he will catch a cough, and be noisy. They have a washer, certainly.

When Junius tries to show that the box is a greater stay to the arm than the barrels, he forgets that Mr. Birch's axle has the box as a stay as well as other axles, and the barrels as a stay, too, in addition.

I have examined several of Mr. Collinge's axle-arms, and in none have I seen the incision one inch and a half in width.

"Will he (Birch Rod) doubt that a pyramid rests firmer on its base than a cube does?" Certainly not; but framing the spokes anglewise to the nave is placing a pyramid upon its apex; and I *must* doubt that a spoke will sustain a greater pressure in an oblique than in a perpendicular position.

Junius is rather fond of quoting passages to try to show that they are contradictory. If he will just put on his spectacles and examine the latter of the two sentences he has quoted in his last, he will find the little word "less," which will, I think, set him right. If he cannot then see the consistency of the two passages in connexion with their contexts, I cannot help his want of perception.

In p. 268, I asked Junius if he could conscientiously say that the extra size and weight of the nave would *bear comparison* with a double action to the wheel? And, again, in p. 394, the same question is repeated; but Junius has not answered it—why? Because the one advantage which he cites will more than counterbalance the five disadvantages (even if he were correct in stating them) which *he enumerates.* Ye Junius, *candid* Junius, says of me, that "it is painful to answer a writer who is uncandid in the extreme."

I now beg of the reader to accompany me back to Junius's last communication, p. 423. He there enumerates in detail the following five disadvantages against the axles in question:—First, the extra size—Secondly, their complicated form rendering them liable to get out of order—Thirdly, the complicated construction involving extra expense—Fourthly, when made for common consumption they are likely to be inaccurate—Fifthly, when inaccurate they would make a noise.

Now what, in the name of wonder, do these ingenious objections amount to? Do they not all resolve themselves into two, namely, extra size and extra expense. Surely Junius does not mean to say that the extra expense which he lays so much stress on is merely for the extra raw material in the barrels and in the increased size of the nave. It must, therefore, be paid for that complication (complication, indeed! about as much as the double nuts), and for that accuracy which guards against those accidents and that noise which constitute the bugbear he is so frightened at; so that three of his objections, so nicely got up and interwoven with the other two, go for nothing. Yet Junius is no "special pleader," but an investigator of subjects philosophically, for the pure love of truth.

Of the two objections, extra expense and extra size, which we have only now to deal with, let me at once discard the former, in assuring Junius that, by careful calculation, it is considered that in an eighteen months' tour, say through Italy, the extra expense would be saved in oil and grease; so that the only objection worth a straw which can be urged against the improved axle-arm is the extra size, and, of course, the consequent trifling extra weight. Why, then, should we dispense with an improvement which gives a double action to a carriage-wheel, just because the nave is increased three-eighths of an inch in diameter? No, Junius, this "jumping over straws and stepping over trusses" will not do in the 19th century, even if your experience had been the result of hardened brains as well as of "hardened hands."

I remain, Sir, yours respectfully,

BIRCH ROD.

London, March 21, 1835.

MATERIALS FOR A MEMOIR OF MR. SAMUEL CLEGG, AND AUTHENTIC HISTORY OF THE ART OF GAS-LIGHTING. BY A CORRESPONDENT.

The name of Samuel Clegg—though hitherto less publicly honoured than it deserves*—is so identified with the rise and progress of the art of gas-lighting in this country, that to give a complete and faithful narrative of the personal history of the one, would be to furnish materials for a truer history of the other than has ever yet appeared. The writer of the present notice has, therefore, great pleasure in complying with a request made to him, as one of Mr. Clegg's earliest and oldest friends, to throw together a few reminiscences of his life and labours for insertion in the Mechanics' Magazine. He regrets that the task has not fallen into abler hands; but what he knows on the subject (which is not a little), he will, at least, state fairly and impartially.

Mr. Clegg was born at Manchester, in the year 1781. He evinced at a very early age a great taste for mechanical and scientific pursuits. On his leaving school, he was placed in the counting-house of his uncle (of the respectable firm of Clegg and Rushouse, of Manchester;) but he could not (because he *would* not) comprehend the Dr. *per contra* Cr. of a merchant's ledger: and, after many fruitless endeavours on the part of his widowed mother and numerous friends, to persuade him to apply himself more assiduously to the business of the desk, his kind uncle thought it best to allow him to follow the natural bent of his genius, and apprenticed him to that far-famed school of practical science—THE SOHO. To Messrs. Boulton and Watt young Clegg served a highly creditable apprenticeship; and after the expiry of his articles, he continued for some time in their employment; and had the superintendence of the manufacture and erection of not a few engine-works of great ingenuity and difficulty.

Mr. Clegg's attention was first directed to the practicability of distilling gas from coal when assisting to illuminate the Soho manufactory. The gas was not displayed, upon that occasion, in any devices on the front of the manufactory, as stated by some writers upon gas-light illumination. The apparatus, if such it could be called, consisted simply of a retort, set in a fire-place in one of the houses, at the corner of the manufactory, a pipe from which was conveyed up the chimney, and terminated in a copper vase. When the gas, &c., came over in sufficient abundance it was ignited, and this was called a Bengal light; there was one at each extremity of the manufactory.

The next time Mr. Clegg witnessed lighting by gas was at the Soho foundry, part of which was thus lighted. The apparatus, however, he never saw; for Mr. Murdoch, under whose direction it was erected, declined showing it to any one.

Soon after leaving the service of Messrs. Boulton and Watt, which was in 1805, Mr. Clegg erected a small gas apparatus at his mother's house in Manchester, for the purpose of drawing by. This answered the purpose so well, that in 1806 he erected an apparatus at his own manufactory, in Dean's Gate, Manchester, on the top of which he displayed a large Argand burner, with a reflector behind. The object of adding the reflector was to see how far coal-gas was likely to answer for light-houses; but the apparatus was then thought to be too complicated and uncertain for such a purpose. From the gasometer at his works he used to transfer the gas into copper balls, and condense it there, for the purpose of exhibiting at a distance; and this was the first *portable gas*.

In 1806, Mr. C. erected gas-works at the following places:—Mr. Potter's cotton manufactory, near Bury, Lancashire; Mr. Barton's dye-house, Manchester; Mr. Thornton's drawing-academy, Manchester; and Messrs. Gallymore's print-works, near Bury, Lancashire. In the

* For ourselves, at least, we must say, that we have never failed, as often as occasion offered, to do full justice to Mr. Clegg's pre-eminent merits as a gas-light engineer. To a communication from a correspondent, published in our 8th volume, p. 446, showing how much the art of gas-lighting was indebted to Mr. Clegg, and to what an extent he had been pillaged by others, we subjoined the following note:—"We happen to know personally a great many facts in relation to the merits of Mr. Clegg; and have no hesitation in adding our humble testimony in support of what is here stated. Could he have described as well as he invented, or perhaps been only as cautious as ingenious, his fame would have stood far higher than it does. We remember once likening him to a common well, at which all who chose supplied themselves, with-*out thinking they incurred* any obligation; and to *which (a great deal worse case)*, some brought such *cracked pitchers*, that in returning home they *spilled by the way* the better half of what they had *drawn off*."—ED. M. M.

latter end of this year, by order of the boroughreeve of Manchester, he lighted one of the lamps in King-street, to see how far gas was applicable for street lights. For this purpose he filled a gas-ometer sufficiently capacious from his own apparatus in Dean's Gate, and then inserted it in a tank of water. The light was much admired by the whole town. Mr. Clegg made an offer to illuminate the whole street, and fix an apparatus for that purpose, for 140*l.*; but, strange to say, the offer was not accepted.

In 1806-7, Mr. Clegg was employed to light the cotton-mills of Henry Lodge, Esq., near Halifax. Knowing that Messrs. Boulton and Watt had, about the same time, undertaken to light the cotton-mills of Messrs. Phillips and Lee, at Manchester, with gas, he was very anxious to have Mr. Lodge's apparatus completed first; and, by working day and night, he was able to light the mill a fortnight before that of Messrs. Phillips and Lee's was ready. This was the first large cotton-mill in the kingdom that was lighted with gas. Mr. Lodge was so well pleased with it, that he gave Mr. Clegg an order to light his extensive mansion called Willow Hall. The apparatus was fixed in the grounds, at a considerable distance from the house. The pipe which conveyed the gas to the burners was suspended from the ceiling, in the form of a handsome chandelier, in the dining-room, and was made in the form of chain; so that the chandelier looked exactly like an oil one suspended in the usual way. Some few years after, a house in Scotland took out a patent for this very contrivance.

During 1806, 1807, and 1808, Mr. Clegg tried various substances as a substitute for coal; such as tallow, oil, paper cuttings, saw-dust from different woods, peat, &c. Some of these materials had a much superior illuminating power to coal-gas, and some were very inferior to it; but none had the least chance of competing with coal in point of economy, and they were all, therefore, abandoned.

In 1809, Mr. Clegg sent a drawing and description of his gas-apparatus to the Society of Arts, for which he obtained the silver medal. In 1810, he erected a gas-apparatus for illuminating the Catholic College of Stonyhurst, near Clithero; and *here he invented*, and first introduced, the 12-inch cylindrical retorts, about six feet long, which are those most commonly used at this day. The lids of these were ground air-tight to the mouth-piece of the retort, so as not to require luting. At this college Mr. Clegg also invented, and first introduced, the lime-machine with complete success; and as the gas was here produced from Kennel coal, the lights were extremely brilliant. In 1811, he illuminated the extensive worsted-mills situated at Dolphinholm, near Lancaster. In 1812, he erected a gas apparatus for Messrs. Greenways' large cotton-mills. As these mills required four retorts, and for the first time they were charged whilst red hot, the plan of using valves to separate each retort was found both dangerous and expensive; to obviate this, Mr. Clegg invented what he called the hydraulic-main, which is now, without any alteration, used in every town that is lighted with gas.

In the same year he lighted Mr. Ackermann's house, shop, and show-rooms, in the Strand; and here he first made use of his fluid lime-water machine. The refuse lime-water gave occasion, however, to so many complaints, that he was induced to try another method, which consisted in spreading the lime, in a state of curd, upon a perforated plate; to remove it with ease, he had an hydraulic joint round the top coon, but this did not answer the purpose intended, owing, as practice has proved since, to want of sufficient surface, and to not repeating the operation by additional layers. Mr. Clegg hereupon introduced cream lime, which was drawn off into a vessel and then renewed; this answered better than the more fluid lime-water.

In 1813, he was engaged by the Chartered Gas-Light Company as their engineer, and in the same year he commenced erecting the extensive apparatus in Great Peter-street, Westminster, where the hydraulic-main, 12-inch circular retorts, and fluid lime-water machine, came into extensive operation.

In 1814, Mr. Clegg superintended the fitting up of the pagoda in St. James's Park. This splendid display of the power of gas illumination was exhibited to the Royal Family on the evening previous to the night when it was burned down by the fireworks. The pagoda was an octa-

gonal figure, 80 feet high from the bridge. At each angle there was a pipe, running the whole height, with a small hole drilled every two inches, through which gas issued; and opposite each of the lowest holes in the perpendicular pipes was placed an oil-lamp, concealed by a piece of sheet-iron, so that when the gas was turned on, the first flame was ignited by the oil-lamp, and each gas flame lighted the one immediately above it all the way to the top. This gave the whole the appearance, when first lighted, of so many rockets ascending into the air. There certainly never was any thing so beautiful before, and it is likely that there never may be again.

In 1815, Mr. Clegg contrived and erected, at the Great Peter-street works, the large reciprocating gasometer, containing 14,000 cubic feet, which, at that time, was thought very large. What gave rise to this was the impossibility, from the nature of the ground, of sinking for a tank, and the great expense of a cast-iron one. This gasometer, notwithstanding its great size, worked with much less friction than any other yet constructed; and so perfectly steady, that he passed the gas from the other gasometers into it before going into the street-mains.

In the same year, Mr. Clegg invented a reciprocating gas-meter; but it required a gasometer to keep the lights steady. One of these was erected at Mr. Ackermann's, to fill his gasometer.

In 1815, he also invented the wheel gas-meter, which is now in general use, and the gas-governor; also the circular wrought-iron retorts, into which the coal was inserted in thin strata, spread upon sheet-iron. The gas from this last mode of decomposition was much superior to the ordinary mode; and averaged 18,000 cubic feet of gas from each chaldron of coal.

During 1814 and 1815, Mr. Clegg erected for the Chartered Company their works in Brick-lane and Curtain-road.

In 1817, he lighted his Majesty's Mint, where the first station-meter was erected, which has been in action ever since. The flat wrought-iron retorts were likewise introduced here with great success, *and the cream-lime machine.*

About this time, Mr. Clegg left the service of the Chartered Company, and was subsequently employed in lighting the towns of Bristol, Birmingham, Chester, Worcester, Kidderminster, &c.

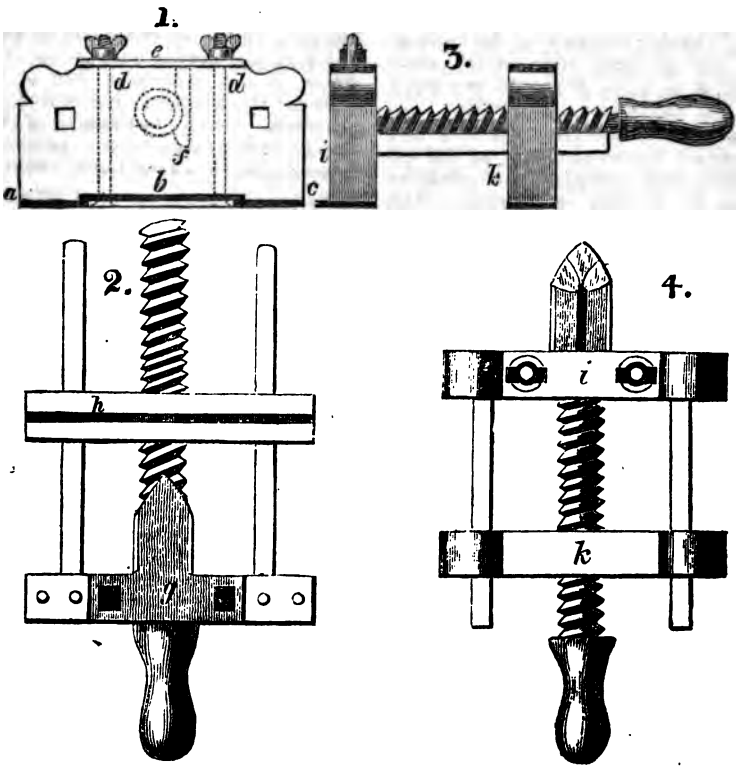
In 1824, Mr. Clegg's attention was particularly turned to steam navigation, and he erected engines in a number of vessels, which gave great satisfaction.

In 1828, he returned to his favourite pursuit, gas-lighting, and his attention, shortly after, was again drawn to the subject of measuring gas; there being many complaints of the water-meters, on account of the pressure they require to work them, the great wear and tear, and the water getting into the fittings. To remedy these objections, he invented the dry gas-meter, which is very fully described in the Mech. Mag., vol. xv. p. 321. Of all his inventions, the dry gas-meter is that which seems to have required the greatest strength and labour; but being convinced, at the first outset, that the delicate instrument called a pulse-glass was perfectly correct in its principle, he persevered till he is now enabled to produce a meter as simple and as correct as the pendulum—and of such small dimensions, that a 4-light meter is only 4½ inches in diameter. It does not require the least pressure to work it; neither is there any wear and tear; nor any water to get into the fittings; and while thus, in all respects, much superior to the water-meter, it is, at the same time, considerably cheaper.

Mr. Clegg went some months ago to Lisbon, to give his professional advice respecting some works of importance about to be undertaken by the new Portuguese Government, and is still there. The writer of this notice is not aware of the particular nature of these works, but of this he feels well assured, that whatever may be undertaken by his friend will be executed in a way not only to reflect credit upon himself, but upon the school where he was educated, and upon the science of the country which gave him birth.*

L. L.

* A Portrait of Mr Clegg, engraved by Roffe, from a painting by Morton, will be published next week, as the embellishment to our present volume. It is an admirable likeness, and does great credit to both painter and engraver.—Ed. M. M.



PENNY'S IMPROVED PLOUGHS FOR STATIONERS, &c.

Sir,—At page 434 of the present volume, you inserted an account of Mr. Penny's improved cutting-presses. I now beg to hand you the promised description of two ploughs adapted to them, or which may be applied with considerable advantage to cutting-presses of the usual construction.

In the ordinary machine, the plough-knife is held in its place by a single square bolt, passing up through the cheek or side of the press, and fastened by a thumb-screw at the top. The knife having but *one* stay, and only bearing upon a small wooden surface, it requires to be screwed very tight, and even then is found to spring and cut the paper, &c., unevenly. To remedy this, it becomes necessary to *dress* the knife, by placing slips of paper or pasteboard *under the knife, before* or behind the bolt, as the case may be, to bring the knife to a level. The conformation of the knife itself frequently increases the deviation, and renders a different quantity and position of dressing, needful with every fresh knife.

All these, and many other inconveniences, are very completely obviated by Mr. Penny's mode of constructing his ploughs.

Fig. 1 is the knife-cheek of Penny's plough, of the usual form and dimensions, but it has a brass plate or shoe at the bottom, *a b c*, which forms the bearing of the plough, and a firm, unalterable bed for the knife; the knife is securely held in its place at *b*, by the two square iron bolts at *d d*, fastened by thumb-screws working on a metal plate *e*. The wooden screw is made to carry this cheek by a pin *f*, which works in a groove

cut for the purpose. Fig. 2 is another view of this plough, turned knife uppermost, showing the form of the knife, *g*, and also the brass plate on the other cheek, *k*, with the groove to run upon the iron rail (*vide s s*, page 435). The metal plate or sole once being made true, it does not become changed, but remains perfectly level; and the knives being the same, no dressing is required. The knives for this plough require to be very carefully made; they should be cast-steel, and any that are warped should be thrown aside by the workman, and not finished up.

In the year 1832, Mr. Penny received 5*l.* from the Society for the Encouragement of Arts, &c., for his improvements in stationers' ploughs; but, judging from the description of it published in the 49th volume of the Society's Transactions, they understood but very imperfectly the nature or extent of the improvements introduced.

Fig. 3 represents a new plough invented by Mr. Penny, for the purpose of cutting off strips of paper, &c., of a much greater height than can be accomplished by the highest ploughs of the present form. In this plough the knife is attached to the left cheek of the plough *i*, which traverses, while the other cheek, *k*, runs steadily upon an iron rail, placed on the right hand side of the press for this purpose. Fig. 4 is a perpendicular view, downwards, of this plough, which shows more clearly the arrangement of all its parts. With a plough of this kind, pieces of unlimited height may be cut off; and it will be found extremely useful by stationers, bookbinders, printers, and others. It fully answers the purpose intended, and is much more conveniently handled, than, judging from its appearance, might be anticipated.

There is a decided advantage in the position given to the knife in these ploughs, which being central and directly under the screw—to which the power is applied—cuts more steadily, has less inclination to spring and twist, and is more easily managed than in the old ploughs.

I remain,
Yours respectfully,
WM. BADDELEY.

London, March 17, 1835.

SEQUEL TO THE BROUGHAM CORRESPONDENCE.

(From the Courier of March 24.)

LORD BROUGHAM AND THE EDITOR OF THE MECHANICS' MAGAZINE.

Mr. Hodgskin to the Editor of the Courier.

Sir,—Had the article* inserted in your journal yesterday under the above title, in which my name is frequently mentioned, been confined to the publication in which it originally appeared, I should have taken no notice of it; but as it has received additional currency through your journal, I request permission to notice one phrase in it, and state one opinion as to the subject of the controversy.

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No person knows so well as I that the merit of originating the London Mechanics' Institution belongs exclusively to Mr. Robertson. But before it was well established that gentleman deserted it, and for the long period which has elapsed since July, 1824, he has never, I believe, ceased to disparage it to the utmost of his means. If to assist in developing his unripe conception, the instant it was publicly announced—if to realise his mere project by dint of great talents and a considerable reputation previously acquired—if to promote the success of the Institute by unwearied exertions, and by a long list of eloquent and seducing lectures—if to nurse and foster it with great assiduity, and with pecuniary means, giving it consideration in the eyes of the public, by the men of rank and celebrity

* The correspondence between Lord Brougham and Mr Robertson.

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16, Claremont-row, White Conduit Fields,
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Mr. Robertson to the Editor of the Courier.

Sir,—In your Journal of the 24th inst. there is a letter from Mr. Thomas Hodgskin, on the subject of the correspondence between Lord Brougham and myself respecting the rise of Mechanics' Institutions in England, which contains some statements so injuriously affecting my character for veracity and consistency, that I trust you will permit me to prove to the public, through the same respectable medium, that they are utterly groundless (I might, without offence to truth, use a much harsher term).

Mr. Hodgskin denies that he was my "employed assistant in conducting some of the earlier numbers of the Magazine," and insists on his right to be considered as "Joint Editor." The fact is literally, however, as I have represented. I was not merely the Editor, but the *Proprietor* of the Magazine (a point but too well established, since it cost me a Chancery suit to establish it); and Mr. Hodgskin *could not* have got his appointment (by whatever name it delighteth him to call it) from any other person than me. It was, accordingly, *by me* that he was employed—*by me* that he was directed and controlled in all he did for the Magazine—*by me* that his services were dispensed with when no longer required—and *to me* that he gave the acknowledgment (now in my possession) for the sum paid him for these services; which sum he was *then* candid enough to say, was "a larger sum" than he had "any claim on."

So much for the person who has made the present attack upon me—now for the *attack itself.*

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But though "the merit of originating" the Institution is now allowed by Mr. Hodgskin to "belong exclusively to Mr. Robertson," he asserts, that "before it was well established" I "deserted it"—that it was in my hands, at best, but an "unripe conception," a "mere project," which Dr. Birkbeck had the honour to "foster," "develop," and "realize"—and that I not only deserted it, but have never "ceased to disparage it to the utmost." That I deserted the Institution, is true; but that was not till *after* it had been perfectly "well established," so far as plenty of members, and a good code of laws, could serve to establish it—till *after* its managers had "*deserted*" the great principle on which it was founded, namely, the independent principle of "self-support," and made of it a charitable Institution, subsisting chiefly on benevolent subscriptions and gratuitous lectures (the latter excluding all method, and nearly all utility in the plan of instruction)—till *after* the laws of the Institution had been shamefully broken through, and the mechanics thrust out of that predominant share in the management which the laws gave them—till *after* it had taken that character which has ever since deprived it of all real claim to the title of a *Mechanics'* Institution—not, in short, till *after* all hope had vanished of seeing it rescued, through any individual effort of mine, from the evil influences under

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which it had fallen. Instead of Dr. Birkbeck being the person to "foster," "develop," and "organise" my original "conception" or "project," he it is who has been the chief means of rendering the Institution *what it is*—a Mechanics' one in *name* only — the mere substanceless shadow of the thing it was meant to be. For proof of all this I am again happy to be able to quote Mr. Hodgskin himself! He shall, by a writing under his own hand—penned at a time when the facts were all fresh in his knowledge—prove that all he now asserts is absolutely and entirely erroneous. When it was resolved to celebrate, by a public dinner, the first anniversary of the foundation of the Institution, I sent a note to Mr. H., stating that I could not, consistently with the views I entertained of the course which things had taken, attend that dinner, and that I supposed he would feel in the same situation. To this note he sent me the following extraordinary answer; for correct feeling and sound reasoning it is probably matchless:—

Dear R.,—My motive for going to the dinner is shortly this. You know that I never set any value on the rules, and care not how much they are violated; and though I think it would be more manful to propose the abrogation of the rules than secretly violate them, yet I will never object to a rule being violated. Whatever intrigues, if any were made use of to influence the elections, I know nothing of them, and can only consider, therefore, the present members of the Committee as properly chosen; and whether there is one or two, or half a dozen more gentlemen on the Committee than the rules allow, while those gentlemen are chosen by the members, I shall make no objection to them; at the same time, I think it quite absurd to call Francis Place, *Esquire*, a working mechanic, at the same time and in the same breath. It is an absurdity, however, that it is so trifling in my estimation that I will not quarrel with it.

The Institution is NOT EXACTLY A MECHANICS' INSTITUTION; *it is not all what you and I thought of—what you and I wished, hoped for, struggled for*; still I think it is calculated to do good, and I do not think it incumbent on me to oppose it, because it is not modelled on my idea. I have always felt that on this point I have no right to complain, because I neither did nor could give the Institution so much time, or take so *much* pains to direct its course, as to entitle *me to direct it afterwards*. I was too inexperienced *for any* such undertaking. ALTHOUGH, THEREFORE, IT IS NOT A MECHANICS' INSTITUTION—not such an institution as you and I wished, it is still, I think, calculated to do some good, *and therefore I go to the dinner*.

As to approving of what the Doctor *and his squad* are doing, I really know so little of its bearings, that I cannot be said to approve or disapprove. They do not do so much as I wish them; but I am not amongst them to know the difficulties they are beset with. I heartily condemn the *gratuitous system*, and shall say so to-morrow; but as the men pay very considerably, it is not gratuitous to them; though what they do pay is not applied as I wish it. I disapprove of fine buildings, costly servants, showy rooms, and all the etceteras; but this is not the present question. We shall not be called on to say aye or no; we go merely to celebrate our first meeting, which was, at the time, so great a pleasure to us both. You must also remember, that this, especially, is part of the system adopted against our wishes; adopted, however, for a specific purpose; and having long ago objected to it myself, nobody can suppose that I now approve of it because I attend the anniversary dinner of our first establishment.

If, as you think, *the proceedings of the Doctor are calculated to ruin the Institution*, that ruin will not be stopped by my presence; and wishing well to every means of instructing the people of every class, I do not think I am at all bound to stay away from the anniversary dinner, because the President and Committee do not act on my ideas. *I shall not mind being thought one of those who have not foreseen the coming disaster, and retired in time.* Shortly, I go to the dinner, not as approving all the proceedings of the President and Committee, but because, as far as I know, they have committed no such flagrant impropriety as should make *me* stay away." &c. &c.

Testimony such as this (testimony, I will make bold to say, but little looked for) makes all farther remark superfluous.

Lord Brougham states, in one of his recent letters to me, that Mr. Hodgskin "he has the pleasure of knowing." Permit me now to congratulate his Lordship on the farther "pleasure" he must feel on seeing that he has for his acquaintance a person capable of *going such lengths* for his friends.

To Dr. Birkbeck, too, my hearty congratulations are due, on the addition to his "squad" of so faithful, honest, upright, and honourable an adherent.

I am, Sir,
Your obedient servant,
J. C. ROBERTSON.

6, Peterborough-court,
March 26, 1835.

ON SECURING STEAM-VESSELS AGAINST THE EFFECTS OF VIOLENT CONCUSSIONS.

Sir,—The late report of the loss of the Eclipse steam-packet has, I rejoice to find, proved incorrect; but as similar catastrophes have been fearfully realised in other instances, I am induced to request a column in your useful Magazine for the purpose of suggesting one or two regulations which, if adopted, will I think go very far to prevent accidents of the melancholy character alluded to.

The most usual case of accidents to steam-vessels (in British waters, at least,) is that of their coming in collision, when their combined velocities make twenty miles an hour, or more, and thereby cause a degree of concussion the effects of which no timbers or planking can possibly resist. The plan I would propose as a measure of safety against such accidents is, that every steam-vessel carrying passengers should be obliged to have the hull divided into compartments, by strong partitions made close and water-tight as far as circumstances will admit, which may be easily done without loss of room, or much expense, or interrupting the communication with the other parts of the vessel. For instance, if the after-part of the fore-cabin were supplied from the lower timbers, with a partition and door of sufficient strength, and if it were furnished with the necessary bolts on the outside, and well secured at night, it is scarcely possible that any concussion, however severe, could drive in or fracture more than the length of the fore-cabin, say 20 or 25 feet at most. In such case the water could have filled the cabin only to the height of the load water-line, and this probably would not exceed the height of five feet. The pressure of water at the moderate height of five feet is not great, and the door might be made with sufficient accuracy to open and shut with perfect ease, and yet so as to admit no leakage but what might be kept clear by the pumps without difficulty. As it is the bow of the vessel that in all cases of collision is the most liable to injury, too much caution cannot be exercised to meet its direful effects. The approach to the engine-house and the after-cabins might be secured in the same way, without inconvenience, and with very little *additional expense*. The anchor, and every other weighty article, might, in such case, be removed to the after part of the vessel, which, of course, would tend to relieve her forward.

I read, with great pleasure, about the middle of December last, in your Journal, a paragraph stating, that the Garry-owen steam-packet, built by Laird and Co., intended to run between Limerick and Kilrush, is divided into compartments, as a measure of safety; so that in case of accident only one can fill, and that only as high as the load water-line. I think the public much indebted to that respectable firm for setting so good an example, and I hope it will be universally adopted. Had the steam-vessels which ran foul of each other on the coast of Scotland, a few years ago, been thus fitted, in all probability not a single life would have been lost. The fractured vessel would, no doubt, have floated until all the passengers had been removed to the other vessel, and the wreck itself also, perhaps, might have been saved.

I remain, Sir, yours respectfully,

W. ALDERSEY.

Homerton, near Hackney,
Feb. 19, 1835.

COST OF LOCOMOTIVE STEAM-POWER.

Sir,—The many inaccurate statements which have appeared as to the actual cost of locomotive steam-power, occasions me to send you the following, taken from Mr. William Jessop's Report on the Midland Counties' Railway, dated Nov. 25, 1832.

I am, &c.,

B.

"The following is the substance of a Report received from the engineer of the Glasgow and Garnkirk Railway, as to the cost of locomotive steam-power, from an experience of fifteen months.

"The engines used on this railway are constructed similarly to those on the Liverpool and Manchester Railway, and cost each with the tender, about 650*l*. The weight of the engine and tender is about six tons, exclusive of water.

"The power of each engine is about 18 horses. The quantity of coke consumed in moving one ton one mile is 1164lbs., the cost of which, at 15*s*. 6*d*. per ton of 2240lbs., is ,097 of a penny. The expense of attendants, oil, hemp, &c., is .18 of a penny, making a

total of .277 of a penny, or a little more than one farthing per ton per mile.

"The engines travel at the rate of from 8 to 10 miles an hour, drawing from 20 to 24 loaded waggons, of 4 tons each, or from 80 to 96 tons gross weight.

"The rate *charged* on this railway, for the moving power for each net ton, is .375 of a penny, or a little more than one-third of a penny per ton per mile."

PADDLE-WHEEL REMINISCENCES.

Sir,—In No. 596 of your Magazine, a correspondent (J. L. S.) proposes what he calls a "new suggestion" for the propulsion of vessels, in lieu of the paddle-wheel. Col. Macerone, also, in a subsequent number, claims the invention, stating the only difference between his contrivance and that of J. L. S. to be, in having six iron flaps instead of two, and that it opened and shut like a Venetian blind. Neither of these gentlemen can have been subscribers to the Mechanics' Magazine from the commencement, or else their memory has not been of ten years' power, for, in the 81st Number, March, 1825, there is the very same plan proposed, more, indeed, like that of the Colonel than of J. L. S., from its resemblance to a window blind. It is called a "boat with wings" (considering the element in which it was intended to move, "fins" would have been better), and the illustrations occupy the first page of the number; it was invented by Mr. Dixon Vallance, who turns poet, or rather rhymester for the occasion, and thus apostrophises his boat—

> "With wings so fitted to each side,
> Through briny waves I'll swiftly glide;
> Impelled by steam's all-conquering power,
> I'll run at *eighteen knots* an hour!"

It would, of course, be unnecessary for me to describe the plan, as persons interested may easily refer to the Number.

I have seen several contrivances upon the same principle, but Mr. Vallance, as far as I have been able to discover, has the priority of them all. It may not be uninteresting to your readers, perhaps, to mention a few of this species of propellers, which I have culled from Galloway's book on the steam-engine, one of which (Melville's) is J. L. S.'s invention *to a T, and differing* from the others in *the propellers being* thrust out at the *stern instead of* at the sides.

The first is that of John Nairn, of Edinburgh, 1828. Two levers are suspended from the sides of the vessel; at the lower end of each lever, two broad plates of iron, with hinged joints, are attached. A pendulum motion is given to the levers; as they vibrate forwards, the plates close, and no resistance is given; in moving backwards they expand, and propel the vessel forwards. Mr. Galloway remarks that many similar contrivances had been tried, and found to fail in practice.

The second is that of John Melville, Esq., 1829. He places on each side of the vessel "folding paddles," which are moved backwards and forwards by traversing frames in grooved guides on the side of the vessel, attached to the piston of a steam-engine. Mr. Melville's second method consists of attaching "similar folding paddles to the ends of rods projected through stuffing-boxes, under the water line, in the stern of the vessel." This, as I have remarked, is almost word for word the plan of J. L. S.

The third is that of Mr. Francis Neale, of Gloucester, 1829, who proposes "hinged paddles, attached to a reciprocating frame so as to fold upwards, or resume a horizontal position when moving forwards, and fold down or assume a vertical position when moving backwards."

A fourth, nearly similar, occurs in the Journal of Patent Inventions. Instead of folding paddles, propellers, similar to a parachute or umbrella, are proposed to be attached to the sides of vessels; the movement is of course reciprocatory. This last appears to me to be superior to the others, inasmuch as in the forward stroke a point only is opposed to the water, instead of a *line*; and I need not refer to Euclid's axioms to demonstrate that the former offers less resisting surface than the latter.

In conclusion, allow me to advise all who would be inventors to consult the volumes of the Mechanics' Magazine, which forms a most complete Encyclopædia of inventions, and it will be some security to them and to the public against reproducing the inventions of their forefathers.

SCRUTATOR MECHANICUS.

Feb. 9, 1835.

LIST OF NEW PATENTS, GRANTED BETWEEN THE 22D OF FEBRUARY AND 6TH OF MARCH, 1835.

Kay Pendleton, Lancaster, flax-spinner, for a heckling-machine of a new construction. Feb. 24; six months to specify.

John Hothersall Hallett, Haven Cliff, Devon, for an improvement in the construction or manufacture of cocks or taps for drawing off fluids. Feb. 25; two months to specify.

William Aitken, of Aberdeen, for certain improvements in the construction of carriages to be propelled by animal or other power. Feb. 25; six months to specify.

Patrick Seyton Hynes, of Paddington, for certain improvements in wheels, axletrees, and boxes, and in an apparatus for retarding or locking carriage-wheels. Feb. 25; six months to specify.

James Aldous, Clapton, smith, for certain improvements on steam-engines. Feb. 25; six months to specify.

William Newton, Chancery-lane, civil engineer, for certain improvements in preparing fibrous or textile plants, either indigenous or exotic, to be used in place of flax or hemp, being a communication from a foreigner residing abroad. Feb. 25; six months to specify.

Richard Prosser, Aston, near Birmingham, civil engineer, for improvements in making nails. Feb. 25; six months to specify.

William Davis, Leeds, engineer, for an improvement in machinery for dressing of woollen or other cloths requiring such process. Feb. 25; six months to specify.

Joshua Taylor Beale, of Church-lane, Whitechapel, engineer, for a simplified and economical steam-engine, which engine may be used for other purposes. Feb. 27; six months to specify.

John Levers and James Pedder, New Radford, Nottingham, for certain improvements in machinery for making bobbin-net lace. Feb. 27; six months to specify.

Frederick Ludwig Hahn Danchell, Great Marlborough-street, musical instrument-maker, for certain improvements in piano-fortes, being partly a communication from his partner, Frederick George Greiner, a foreigner, residing abroad. Feb. 28; six months to specify.*

Robert Wolf, Cornhill, musical instrument-maker, for an improvement in piano-fortes, consisting in the new construction on the principle of acoustics of a sounding body, applicable to every description of piano-fortes. March 2; six months to specify.†

Thomas Fleming Bergin, Fair-view Avenue, Dublin, for improvements in railway-carriages, which improvements are applicable to other purposes. March 6; six months to specify.

John Prince, Bread-street, Cheapside, for an improved mould and apparatus to be used in making paper. March 6; six months to specify.

John Joseph Charles Sheridan, Walworth, chemist, for certain improvements in the several processes of saccharine, vinous, and acetous fermentation. March 9; six months to specify.

Herman Hendriks, Grove House, Blackheath, for improvements in dyeing. March 11; six months to specify.

Joshua Butters Bacon, Sidmouth-street, Regent-square, for improvements in the construction of locomotive steam-carriages applicable to railways and common roads, being a communication from a foreigner residing abroad. March 11; six months to specify.

William Hale, Colchester, civil engineer, for certain improvements on boilers or apparatus for producing motive power. March 11; six months to specify.

William Newton, Chancery-lane, civil engineer, for a method of preparing animal milk, and bringing it into such a state as shall allow of its being preserved for any length of time with its nutritive properties, and capable of being transported to any climate for domestic or medicinal uses, being a communication from a foreigner residing abroad. March 11; six months to specify.

Robert Jupe, New Bond-street, upholsterer, for an improved expanding table. March 11; six months to specify.

John Sylvester, Great Russell-street, civil engineer, for improvements in apparatus used in the communication or transmission of heat to aeriform, liquid, and solid bodies. March 11; six months to specify.

William Bridges Adams, coach-maker, for an improved construction of wheels for all kinds of carriages in which springs are commonly used. March 13; two months to specify.

William Church, Heywood House, near Birmingham, for certain improvements in apparatus to be employed in the conveyance of goods and passengers by land or water, parts of which said improvements are also applicable to the ordinary purposes of steam-engines, and other steam apparatus. March 16; six months to specify.

Richard Hill, Birmingham, for an improvement in door and other locks, and in staples used therewith. March 18; six months to specify.

Andrew Smith, of Belford, Derby, millwright and engineer, for a certain improvement or improvements in printing-machines. March 18; six months to specify.

James Hunter, Ley's Mill, Arbroath, Forfar, for certain improvements in the art of cutting, or what is commonly called facing and dressing certain kinds of stone. March 18; six months to specify.

Henry Walker Wood, Austin Friars, London, for an improvement in obtaining certain oils, being a communication from a foreigner residing abroad. March 18; six months to specify.

William Weekes, King Stanley, Gloucester, clothier, for improved machinery for cleansing, plaining, polishing, and dressing woollen and other cloths. March 25; six months to specify.

Joseph Barker, Southampton-street, Camberwell, for an improvement in the constructing of umbrellas and parasols. March 25; six months to specify.

James Berrie and David Anderson, Glasgow, for certain machinery for making a new or improved description of heddles or healds. March 25; six months to specify.

John Brunton, West Bromwich, Stafford, for certain improvements in the construction of retorts for generating gas for the purpose of illumination. March 25; six months to specify.

William Houstoun, Fleet-street, printer, for certain improvements in tools, implements, or apparatus, which are either used in or subservient to the art of letter-press printing. March 25; six months to specify.

* This patent being in litigation, was not sealed till Feb. 28; but it bears date the 1st Sept. 1834. By order of the Lord Chancellor.

† This patent, with the preceding one being in litigation, was not sealed till March 2; but it bears *date the 6th Nov. By order of the* Lord Chancellor.

NOTES AND NOTICES.

Steam-Engine for Locomotive Purposes.—Your correspondent Saxula, No. 601, p. 358, still appears to be in want of a 10-horse power engine, of strong and permanent workmanship. I can furnish Saxula with an engine of this description; and if he does not reside at too great a distance, he may try the merits of it with his carriage, and, if approved of, may treat for it afterwards. The engine is a rotary one, and to work with a constant flow of steam, having no valves; and if uncommon quick speed be a desirable attainment, it may be accomplished without any injury to the engine. Farther, if this particular engine should not meet Saxula's wishes, I can produce drawings of others which I feel confident will. I am, Sir, &c. A TRADER FROM THE FIRST.

Colonel Macerone's "Spirited Challenge."—"H." in reply to Colonel Macerone's "spirited challenge," begs to refer him to the Mech. Mag., No. 554, vol. xx. p. 406, et seq., where he will find himself proved, *out of his own mouth, even something more* than a "random assertor." The charge there made, he, the "Colonel," has never once attempted to disprove; and, until it is answered, "H." sees no reason for producing any more: when it *is*, he will be prepared with at least fifty others. "H." trusts that, although Mr. Macerone is "too poor to call himself a gentleman in *this* country," he may yet be able, out of the savings arising from his steam-carriage running "1700 miles without costing a shilling for repairs," to provide himself with that useful work, a pocket Johnson's Dictionary. The hint, he may depend on it, is good, "although "annonymous." As to the worthy Colonel's choice selection of epithets, "H." begs to *return* them to the place from whence they came, and where they will, doubtless, find themselves "quite at home."—H.

"Senex" is right in his conjecture. The Mr. Hodgskin whom Lord Brougham "has the *pleasure* of knowing," is the same Mr. Hodgskin whom the Useful Knowledge Society, of which his Lordship is president-superintendent, denounced, in their "Rights of Industry," as the "Orator of Plunder," whose Lectures on Political Economy at the London Mechanics' Institution (afterwards published under the title of "Popular Political Economy"), were only calculated to promote universal spoliation and confusion.

The "Member of the London Mechanics' Institute, of five years standing," is evidently very imperfectly acquainted with the real facts of the case; as he will himself be satisfied on the perusal of our present Number. Were the Institute considered as a *Mechanics'* Institution, really in a flourishing condition, there would be some force in what he urges in favour of Dr. Birkbeck; but our position is, that as a *Mechanics'* Institution it has been utterly ruined, and chiefly through the Doctor's instrumentality. Let a return (such as we have often called for) be obtained, showing the number of *working mechanics* belonging to the Institution, in each year from its commencement, and if that does not make good all we have asserted, we shall never more open our lips on the subject—except, indeed, it be to apologise, as we shall be well inclined to do, for all we have said to the disparagement of Dr. Birkbeck. If our correspondent's "love for truth" is as great as he professes, he will himself, as a member of the Institution, make some small exertion to procure this very necessary information.

We are obliged to "Semper Idem" for his friendly caution, but it is scarcely needed. We have sedulously refrained from saying one word more respecting Lord Brougham and Dr. Birkbeck than was necessary for our own justification; and have not made use of one-half of the arrows in our quiver. He must do us the justice to allow, that we have given good proofs for every thing we have *as yet* advanced; and ought not, therefore, to be under any uneasiness as to our future movements.

Will the seven "mechanics" (could no more be found?), whose names are to a paper which has been sent to us, try among them to explain, why a short tenure of office should be a good thing in every other case, except that of the President of the London Mechanics' Institution? The loan of money, for which they seem so ready to fall down on their knees in the gutter, was the very worst thing that ever befel the Institution; for it is that which has saddled it with its perpetual dictator, and makes its regeneration, as a Mechanics' Institution, next to impossible. We have not time, before this week's publication, to ascertain how the fact actually stands with respect to the rate of interest; and can only say, at present, that 4½ per cent. was publicly stated, times without number, to be the consideration agreed for. It matters little, however, what the rate was; the investment—for a medical practitioner—was a capital one, at any rate.

We cannot tell "A Country Subscriber" where to procure a velocipede on Baron Drais's principle; but it is of so simple construction, that we should imagine any country carpenter would be at no loss to supply one. The baron is no longer in this country.

A communication of Mr. Lake's reports "of the progress of the work," will be very acceptable.

Our Publisher will give half-a-crown for copies of our 289th Number, and Supplement to Vol. X.

Communications received from Mr. Dakin—U. G. R.—Mr. Livesey—Philopopulus—J. H.—J. L.—W. H. O.—Query—Mr. John Thomas.

The Supplement to our present Volume, containing Titles, Index, &c., with a Portrait, on Steel, of Samuel Clegg, Esq., C. E., will be published next Saturday, Price 6*d.*; also the Volume complete, in boards, Price 8*s.* 6*d.*

☞ The Editor of the Mechanics' Magazine has made such arrangements as enable him to offer, on unusually advantageous terms, to undertake the solicitation of Patents for New Inventions, the drawing and revising of Specifications, and generally every other branch of Patent business. Drawings of Machines executed with accuracy and dispatch.

6, Peterborough-court, Jan. 3, 1835.

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END OF THE TWENTY-SECOND VOLUME.

INDEX

TO THE TWENTY-SECOND VOLUME.

A.

Account file, 284
Adelaide-street Gallery, 463
Agassiz, M., notice of, 31
Air *v.* water, 271
Air-pump, single-valved, 328
Airy, Professor, 176, 447
Almanacs, cheap, 64, 152
——— for 1835, 152, 170
Aloe cables, 111
Aldersey, Mr. Wm., twin steam-boat 225; on securing steam-vessels from the effects of concussions, 477
America, winter of 1834-5 in, 416
American patents, 13, 94, 109, 204
——— cotton twist, 96
——— railways, 125, 240, 271, 440
Ames's paper-cutting machine, 110
Anchors, how to prevent from driving, 107
Apiarian system, Nutt's, 23, 91, 128, 132, 216
Arago, M., 32, 144
"Arboretum Britannicum," Loudon's, 144
Architectural disfigurers, 15
Aris, J. R., Esq., apparatus by, for showing the causes of the seasons, 145
Arkwright, Sir Richard, 424
Arnett's "Art of Book-binding," 409
Arsenic, tests for, 378
Arts, useful, progress of, 178
Arundel castle, 112
Astronomer-royal for Scotland, 176
Axle-trees and axle-friction, 163, 202, 227, 267, 356, 393, 421, 468
Axles of railway-carriages, 282

B.

Baddeley, Mr. William, on Courbe's Theory of the Brain, 9; substitutes for rags in paper-making, 21, 106, 134; Barton's pistons, 37; fires from ignited flues, 54; floating fire-engines, 113, 246; proofs that flame is hollow, 151; fire-ladders, 184; Cooper's patent jars, 201; London fires in 1834, 349; Penny's stationers' *cutting-press*, 433; Penny's stationers' *ploughs*, 473
Badnall's, Mr., undulating railway system, 16, 211, 253, 261, 358, 374, 453
Baines's, Mr., "History of the Cotton Manufacture," 424
Ball projector, 192
Barton's pistons, 37, 53
Beaufoy's, Colonel, Works, 380
Becher's, Lieutenant, artificial horizon, 192
Beer pump, Warnes's, 417
Beer-drinking Britons, 272
Bees', Nutt's, system of managing, 23, 91, 128, 132, 216
Bergin's railway carriage-buffer, 224, 288
Bielefield's papier-mâché ornaments, 287
Binding, illuminated, 411
Birch's patent axletree, 129, 163, 202, 227, 267, 356, 393, 421, 468
Birmingham town-hall, 271, 368
——— and London railway, 436
Biscuit-baking machinery, Grant's, 449
Bistre, preparation of, 442
Bleaching mania, 348
Blind man's Bible, 112
Blower, Clark's, 18
Boat, safety, 109
Bones, the, coloured by food, 107
Bonnycastle's, Charles, mode of propelling canal-boats, 14
Bookbinders' cutting-machine, improved, 205
"Bookbinding," "Art of," by Arnett, 409
Booth, David, Esq., new system of calculation, by, 91, 102
Booth's, Sir, Felix, baronetcy, 256
Boots, water-proof, 285
Brain, the, Courbe's theory of, 9
Bramble-wine, 224
Bread from wood, 192
Breakwater. See *Portland*.
Bridge, floating, between Portsea and Gosport, 208
British Association, 176, 220
——— Museum, 420
——— enterprise, 464
Bronze sheathing, 32
Brookes's domestic silk-spinner, 209
Brougham, Lord, correspondence with, on the rise of Mechanics' Institutions in England, 432, 457 sequel to do., 474

Brunel, Mr., and the Thames-tunnel, 16
Bullen, Rear-Admiral, improvement by, in fire-tongs, 379
Bulwer, Mr. E. L., and the Southwark Literary Society, 288
Burden's twin steam-boat, 93, 224
Burgess's paneidolon, 360
Burlington Arcade, 15
Busk, Keene, and Co.'s mode of condensing steam by external application, 366, 376, 423

C.

"Cabinet Cyclopædia," 444
Cables made of the aloe, 111
Calculating boy, Russian, 191
———— machines, 192
Calculation, Booth's new system of, 91, 102
Camera lucida, Wollaston's, 360
Canadian twin steam-boat, 191
Canal boats, modes of prepelling, 14, 32
————, quick passage, 240, 346, 435
Canals, navigation of, by steam, 367
———, benefits of, 431
Candlestick, self-snuffing, 161
Candle-light and gas-light, comparative cost of, 395
Caoutchouc lining for coffins, 162
———— whips, 284
———— boots and shoes, 285
———— solvent, 463
Carbon, newly-discovered compounds of, with hydrogen, 13
———, chlorides of, 13
Carey's, Rev. R., gun with revolving breech, &c., 358
Carpets, lithographed, 112
Carriages, extrication of horses from, 206
Cashmere, vale of, 238
Cattle-markets, Smithfield and Islington, 464
Cats, why they always fall on their feet, 30
Cement, Algerine, 240
Cements, 368
Chameleon, the, 160
Charts, probable source of errors in, 48
Char-volant, Parisian, 32
Cheverton, Benj., Esq., on the claims of mathematical science, 77
Chichester earthquakes, 90
Chinese printing, 464
Chimney-sweeping, children and mechanical, 1, 3, 7, 18, 188, 277, 356, 375, 423, 442
———— flues, 188
———— that requires no sweeping, 277
Cholic, plumbers, antidote to, 176
Church's steam-carriage, 320
Cigar nuisance, 48
——, self-igniting, 284
Circulation in microscopic objects, 204
Clark's blower, 18
Clegg, Sam., Esq., C. E., memoir of, 470
Cliffs, giant, 320
Cloth-dressing machine, 13
Coal-mines, mortality from explosions in, 16, *100, 131, 197, 244*
Cobalt, 320
Coffee, French mode of making, 176
Coffins, caoutchouc lining for, 162
Collier's steam-boiler, 240
Collinge's patent axles. See *Axletrees.*
Colour, influence of, on heat, 144
Columns, strength of, 287
Combustion, spontaneous, 320
Comet, the Halley, visible in America, 31
Competition plans, 287
Concrete foundations, 284
Cooking apparatus, Weekes's, 321
Cooper's patent jars, 201
Cordage, strength of, 250
Cork, lighthouse at, 111
Cornwall, mines in, 222
Cort's, Mr., railway calumnies, 264, 288, 291, 340, 384
Creation, the days of, 224
"Credit Pernicious." Mr. Rosser's, 463
Cunningham's shifting paddle-wheel, 36, 208, 251, 339; self-snuffing candlestick, 161
Curtis's, Mr., convex wire-gauze spectacles, 432
Cyanometer, the, 320
Cylinders, hollow and solid, strength of, 26

D.

Davy's safety-lamp, dangers attending, 131 197, 244
Deakin, Mr. Thomas, on working inclined planes, 54, 136; on extinguishing fires, 201, 246
Deane, Mr., submarine operations of, 176
Detonating powder, explosive force of, 203, 269
Differential calculus, 374
Dogs, improved muzzle for, 288
Dover, respectability at, 112
———, large water-tank at, 191
———, straits of, rising of the sea in, 271
Drummond light, improved, 111
Dry rot, remedies for, 45, 150, 197, 206
Dublin and Kingstown railway, 47, 224
Dundonald's, Earl of, new motive power, 29, 41
————, revolving steam-engine, 193, 229

E.

Earth, the, population of, since the creation, 10, 108
Earthquakes at Chichester, 90
Eastern counties railway, 272
Edge-tools, improved mode of tempering, 285
Education, influence of females on, 112
Eel-skin dress, water-proof, 48
Egypt, railroad in, 111
Erie Canal, 431
Eudiometer, Weekes's, 369
Euphrates expedition, 328

F.

Factory life, 96
Factories in Ireland, 96
Fairman's rotary and reciprocating steam-engine, 257
Fairy circles, 192
Fall of bodies, 282
Feather-dressing machine, 95
Female influence on infant education, 112
Filter, cheap and effective, 189
Fire-engines, Riley's branch-pipes for, 94
———, floating, 113, 201, 246, 287
—— ladder, 184
Fires from ignited flues, 54, 87
—— in London in 1834, 349
——, English and French, 112
——, water-side, 201
Fire-tongs, improvement in, 379
Fish, new mode of catching, 102
Fishmongers'-hall, 271
Fish-pond, extraordinary rise in, 367
Flame, phenomena of, 57, 86, 123, 151, 197
Flax, New Zealand, 432
Fogs, fattening effect of, 176
Forman's, Captain W., double-bar lever-pendulum, 25
Forrester's improved planetarium, 97
Fossil cliffs, 320
Frazer's hearth, 245, 280, 372
Fulton's first steam-boat model, 448

G.

Galloway's paddle-wheel. See *Morgan's*.
Galt, John, Esq., machine invented by, for in-door riding, 128
Gas-consumers, useful hints to, 367
Gas-holders, mercurial, 232, 359
Gas-light and candle-light, comparative cost of, 395
Gas-lighting in France, 416
———, progress of, 432
——— history of, 470
Germany, the periodical press in, 91
Geodesical and superficial measurement, difference between, 447
Glass, method of drilling holes in, 279
——— cleaning, 416
Glass's chimney-sweeping machine, 1
Gold, imitation of, 224
Gordon on Locomotion, 2d edition, 262
Gosport and Portsea, floating bridge between, 208
Grant's biscuit-baking machinery, 449
Green colouring for walls, receipt for, 384
Greenwich railway, 463
Gregory, Dr. O., on Barton's pistons, 53
Gridiron, Clark's improved, 206
Gulph stream, 208
Gun with revolving breech, 358
Gurney, Mr. Goldsworthy, case of, 288, 303, 323, 347, 392, 438, 444
Gypsies, colony of, in Louisiana, 288.

H.

Hall's steam-engine improvements, 82, 260, 278, 329, 376
Hams, simple mode of smoking, 269
Hancock's steam-carriages, 16, 49, 88, 287, 336
Hare's, Prof. apparatus for making ice, 33
Hat-block, metallic frame, 206
Heat, influence of colour on, 144
Heating apparatus, Perkins', 58, 101
Hemp, preparation of, 448
Herschell, Miss Caroline, 448
Hibernia steam-carriage, 289
Himalayan mountains, Royle's illustrations of the botany, &c. of, 234
Hindoo literature, 128
Horizon, artificial, Lieut. Becher's, 192
Horn, cementation of scraps of, 207
Horse-power, Eastman's, 286
Horses, extrication of, from carriages, 206
Howard's vapour-engine, 30, 40, 432
Hurley's compensating pendulum, 169
Hurricanes, rate of progress of, 448
Hydrogen, newly-discovered compounds of, with carbon, 13

I.

Ice, Professor Hare's apparatus for making, 33
—— exportation of, to India, 256
—— boat, steam, 448
India, steam communication with, 187, 272, 320, 464
—— and its capabilities, 234
——, exportation of ice to, 256
Infant schools, 112
Ink from coal, 189
Inventor; A Poor, case of, 357
Ireland, factories in, 96
Iron, increasing use of, 88
—— fusion of, 224
—— castings, 272
Islington cattle-market, 464
Isometrical perspective, 39
"Isometrical Drawing," Mr. Sopwith's Treatise on, 412

J.

Jars, Cooper's patent, 201
Jonathan, Brother, 447
Jopling, Jos. Esq.: on isometrical drawing, 39; on the conflagraaion of the Houses of Parliament, 168

K.

Kitchen, royal, at Brighton, 17
———, steam, 188
Kyan's remedy for the dry rot, 45, 150, 197, 198, 208

L.

Lamb, Alexander, Esq., on the origin of the Portland breakwater, 65, 136

Lamp oil, how to colour, of different tints, 204
Lancaster canal, quick passage-boats, 435
Landale, Mr. D., on the various modes of propelling vessels, 11
Laughing gas, experiment with, 384
Liberty, cap of, 256
Libraries, external character of, necessary to be studied, 410
Lighthouse, Cork, 111
Lighthouses, Roura's improvement of Drummond's mode of illuminating, 111
Lincoln, Great Tom of, recasting of, 208
Literature and science, connexion between, 32
Lithography, application of, to table-covers and carpets, 112
Liverpool and Manchester railway, 48, 262, 264, 291, 320, 330, 340, 374
——— ——— ———, new, 333, 362
Locke, Jos., Esq. C. E., Report by on the new Liverpool and Manchester railway, 362
Locomotion, Gordon on, 262
Locomotive engines, White's improvements in, 441. See also *Steam-carriages*.
Locomotive steam-power, cost of, 477
London Mechanics' Institution, 175, 432, 457, 480
——— fires in 1834, 349, 354
——— fire-establishment, 184
——— bridges, improvements suggested in, 199
———, City of, improvements, 256, 463, 464
Loudon, J. C., Esq., on the right employment of wealth, 132; "Arboretum Britannicum," 144
Lubbock's, Mr., tide-tables, 171, 192
Luxor, obelisk of, 48

M.

Macerone and Squire's steam-carriage boiler, 32, 241, 394
Macerone's, Col., sail-burner, shot-proof steam-ship, &c., 281
Machinery, exportation of, 16, 131
M'Curdy's patent propeller, 465
Manchester, factory life at, 96
Manual labour not inconsistent with mental cultivation, 144
——— ——— academy, 368
Mariner's compass of Chinese origin, 160
Mathematics and mathematicians, 27, 77, 147, 261
Maudsley's steam-carriage, 37, 108
Mechanics' Institutions, rise of, in England, 432, 457
Meteorological phenomenon, 128, 192
Meteorological observations for 1834, 276
Meteors, fiery, in America, 208
Microscopes by Amici, Trecourt, &c., 128
Microscopic objects, Mr. Pritchard's list of, 204
Mill-stones, improved, 219
Mineral plans and surveys, prevailing defects of, 412
Mining, deep, 182, 222
Monkwearmouth colliery, deep shaft at, 182
Morgan's paddle-wheel, 273
Mouldiness, origin of, 176
Murray, Mr. John, on Kyan's remedy for the dry rot, 44; on the nature of flame, 57, 197; Perkins' heating process, 58, 197; bleaching mania, 348; laughing gas, 384
Muslins, Scotch India, 48

N.

Navigation, inland, benefits of, 431
Newton, Sir Isaac, 144
Norfolk, the late Duke of, building mania of, 112
Nutt's apiarian system, 23, 91, 128, 132, 216

O.

Obelisk of Luxor, 48
Optical effects, some remarkable, 283

P.

Paddle-wheels, 11, 35, 208, 250, 251, 273, 280, 336, 339, 478
Panama, isthmus of, railroad across, 247
Paneidolon, Burgess's, 361
Paper, straw, 134
———, ancient and modern, 189, 348
Paper-making, substitutes for rags in, 21, 44, 56, 106, 134; Ames's cutting-machine, 110; Truman's cylinder-machine, 110
Papier-mâché ornaments, Bielefield's, 287
Parliament, Houses of, conflagration of, 54, 168; site for the new, 134
Patentee, honest, 288
Patents, new British. *See separate List.*
———, solicitation of, 384, 448
———, American. *See separate List.*
Paul's, Lewis, cotton-spinning inventions, 425
Pedlar, philosophical, 367
Pendulum, Captain Forman's compensating, 25
———, Hurley's ditto, 169
Penny Cyclopædia, 123, 135
——— Magazine, 420
Penny's stationers' cutting-press and ploughs, 433, 473
People, the, improvement in the condition of, 8
Perkins's, Mr. A. M., heating apparatus, 101, 197
Perpetual motion, 224, 463
Perspective delineator, Shires's, 468
Pin-heading, process of, 96
Pistol whips, 206, 284
Pistons, Barton's, metallic, 37, 53
Planetarium, Forrester's, 97, 466
Planetary wheel-work, 199, 466
Planes, inclined, on working, 54, 136, 432
Platina mines of Russia, 175
Plumbers' cholic, antidote to, 176
Portland breakwater, 66, 115, 136, 233 269, 408, 442

Portsea and Gosport, floating bridge between, 208
Potash, Parce's mode of making, 14
Potatoes, sugar, wine, &c. from, 384
Powder, detonating, explosive force of, 203, 269
Printing, Chinese, 464
Pritchard's, Mr., list of microscopic objects, 204
Pump, Warne's improved, 417

R.

Railway, Dublin and Kingstown, 47, 224, 272, 290
——— Liverpool and Manchester, 48, 262, 264, 291, 320, 330, 340, 374
———, new do., 333, 362
———, Alexandria and Suez, 111
———, North Union, 368
———, London and Birmingham, 160, 436
———, Isthmus of Panama, 247
———, Eastern Counties, 272
———, Greenwich, 463
——— accident, 240
——— calumniators, exposure of, 263, 288, 291, 330, 340
Railway carriages, improvements in the construction of, 282, 288, 367
———, performances of, 190
———, portable, 384
——— question, practical, 40
———, undulating, 16, 211, 253, 261, 358, 374, 388, 453
——— viaduct, magnificent, 368
——— waggon, propelled by sails, 192
Railways, want of, the cause of the fall of Rome, 96
———, cost of, per mile, 375
——— cost of steam power on, 477
———. Should they be undertaken by Government? 106
———, continental, 109
———, American, 125, 240, 271, 440
" Records of General Science," Thomson's, 334
Red Tape School, 271
Riding, in-door, 128
Rivers, quantity of solid water carried by, into the sea, 464
Rocket, the, principle of, 112
Rosser, Arch., Esq., on children chimney-sweepers, 3, 375, 442; on Hall's steam-engine improvements, 278, 329
Rotary steam-engines, 100
Roura's improvement in Drummond's mode of illumination, 111
Royal George, wreck of, 176
Royal Society medals, 192
Royle, J. Forbes, Esq.; his "Illustrations of the Botany, &c., of the Himalayan Mountains," 234
Russell's steam-carriage and boiler, 224, 368, 385
Rust, prevention, of, 224
Rutter, J. O. N., Esq., on the comparative cost of gas and candle-light, 395

S.

Safety lamp, Davy's, dangers attending, 131, 197, 244
Sail-burner, Col. Macerone's, 281
Sailing in the wind's eye, 119
St. Helena inclined plane, 432
Salmon, Mr. Morris, death of, 336
Salt water, conversion of, into fresh, 16, 245, 280, 372
Sang, Mr., on the progress of the Useful Arts, 178
Sap, ascent of, force of, 230
Science and literature, connexion between, 32
Science, ignorance of, in high quarters, 271
Scotland Steam-carriage Company, 368
Scott's legacy to the city of Philadelphia, for the encouragement of useful inventions, 96
Screws, endless steam, 110
Sea-serpent, American, 240
Seasons, the, apparatus for showing the causes of, 145
Sebastian's machine to prove the proportion of the fall of bodies, 282
Shaft, the deepest, in the world, 182
Shagreen, how made, 287
Sheathing bronze, 32
Sharp, Roberts, and Co.'s railway steam-carriage, Hibernia, 289
Shell, cementation of scraps of, 207
Ship-sinking system, 448
Ships, ventilation of, 205
Shires' perspective delineator, 468
Shoes, water-proof, 285
Silk-spinner, Brooks's domestic, 209
—— cultivation of, in America, 210
———— ——, in England, 407
Silver, new American, 95
Simpson, Mr. J. W., on the cultivation of silk in England, 407
Sky, the, cause of the blue colour of, 271
Smithfield cattle-market, 464
Somerville, Mrs., 160, 448
Sopwith's Treatise on Isometrical Drawing, 412
South Australian Association, 58
Southwark Literary Society, 272, 288
Spectacles, Curtis's convex wire-gauze, 432
Spirit-level for railway operations, 282
Squares and square roots, tables of, by Mr. D. Booth, 102
State Paper-office, new, 15
Stationers' cutting-press and ploughs, Penny's, 433, 473
Steam, condensation of, by external application, 82, 260, 329, 366, 376
Steam-boat mortality in America, 287
———— machinery, 419
———— model, Fulton's first, 448
——— boats, armed, 48

Steam-boat, iron, 48, 111, 191
———, twin, 11, 51, 93, 141, 191, 224, 225
Steam-boiler, Collier's, 240; Macerone and Squire's, 241
——— boilers, incrustations in, 224
———, explosions of, 271, 285
Steam-carriage, common road, Hancock's, 16, 49, 88, 287, 336, 347
———, Gurney's, 303, 323, 347, 392, 438, 444
———, Macerone and Squire's, 32, 241, 394
———, Maudslay's, 37, 108
———, Russell's, 224, 368, 385
———, Church's, 320
Steam-carriages on common roads, Second Parliamentary investigation, 303, 323; remarks on, 347, 392, 438, 444
———, Witty's mode of propelling, 344, 441
———, relief-wheel for, 350
———, railway, Sharp, Roberts, and Co.'s, 289
———, performances of, 190
Steam communication with India, 187, 272, 320, 464
Steam-engine, invention of, 368
———, Fairman's rotary and reciprocating, 257
———, rotary, 100
———, Earl of Dundonald's revolving, 191
Steam-engines, cost of, in England and in France, 48
———, Hall's improvements in, 82, 260, 329
———, Allen's ditto, 207
——— in Cornwall, 222
Steam explosion, 256
——— kitchen, 17, 188
Steam ice-boat, 448
Steam navigation, invention of, by William Symington, 32
———, benefits of, 128
——— printing-press, first, 464
——— ship, miniature, 144
——— vessels, Government, 275
——— driven under the waves by excess of power, 431
———, on securing, from the effects of violent concussions, 477
——— waggon, 240
——— wheel, Woodhouse's, 177
Stephenson, Robert, Jun., Esq., Report of, on the undulating railway, 388
Stereotype metalagraphic printing, 283
Storms, rate of progress of, 448
Strength, human, 48
Strength of materials, 287
Sun, total eclipse of, 432
———, rays of, diminution in the force of, 463
Suspension-bridge, mountain, 111
Suspension-bridge over the Garonne, fall of, 368
Swiftness of insects, 32
Symington, William, and the invention of steam navigation, 32
Symington's, William and Andrew, paddle-wheel, 337

T.

Tanning, quick, 95, 108
Telegraph, night, oxy-hydrogen, 144
Telford, Thomas, Esq., legacies of, 111, 160
Thames tunnel, 16, 111, 439
Thomson's "Records of General Science," 334
Threshing machine, steam, 128
——— worked by manual power, 144.
Tide tables, Mr. Lubbock's, 171
Tobacco, cultivation of, in Russia, 192
Tract Society, 174
Tractive power on roads, simple mode of increasing, 358
Trade restriction system, 48
Tunnels, pedestrian, 366

U.

Useful Knowledge Society, 152, 170

V.

Valve, throttle, improved, 284
Vapour-engine, Howard's, 30, 40, 432
Vegetation, philosophy of, 139, 230
Ventilation of ships, 205
Vessels, on the various modes of propelling, 11, 36
———, ventilation of, 205
Vignoles, Chas., Esq., C. E., Report of, on the new Liverpool and Manchester railway, 333, 362.

W.

Waggon, steam, 240
Water, salt, conversion of, into fresh, 16, 245, 280, 372
———, Mr. Macneil on the resistance of, 240, 266; Col. Beaufoy's experiments on, 380
——— proof dress of eel-skin, 48
——— tank, large, at Dover, 191
Watson, Henry; on earthquakes at Chichester, 90; mercurial gas-holders, 232
Wealth, on the right employment of, 117, 132, 251
Weather of 1834, 276
——— rules, old, 288
——— in America, during winter of 1834 and 1835, 416
Weekes's cooking apparatus, 321
——— eudiometer, 359

Weights and measures, new, 185
———, machine for shouldering, 206
Wells's process for converting salt-water into fresh, 16, 245, 280, 372
Wheel, Davis's weathercock, 15
———, double-power re-action, 206
Wheel-work, planetary, 199
Wheels, railway carriage, improvement in, 367
Whip, pistol, 206, 384
White, Mr. John, improvement in the fire-bars of locomotive-engines, 441
Whitelaw, Mr. James, canal quick passage-boats, 346; steam-boat machinery, 419
Witty's patent mode of propelling steam-carriages, 344, 444
Wollaston's camera lucida, 360
Wood, bread from, 192
Woodhouse, Mr. James, steam-wheel invented by, 177
Wool-spinner, vertical, 205
Worlds, plurality of, 92
Wyatt's, Mr. John, claim to the invention of the cotton-spinning machine, 424

Y.

York column, the, 10

Z.

Zealand, New, flax, 432
Zinography, 16, 30, 128
Zoological-gardens, 464

NEW PATENTS.

BRITISH.

	PAGE
C. Tongue, travelling carriage accidents	63
R. Witty, saving fuel and burning smoke	63
S. Draper, bobbin-net manufacture	63
J. Gardner, turnip cutter	63
J. C. Daniell, woollen cloth machinery	63
R. F. Martin, cements	63
J. J. Cordes, nail-making	63
Do. rivets and screw-bolts	63
B. Hick, locomotive steam-carriages	63
T. Sharp and R. Roberts, spinning machinery	64
J. Ericsson, paddle-wheel	64
G. R. Elkington, spectacles	64
T. Searle, steam-boiler	64
Lord Audley, lock-protector	64
S. Seward, steam-engine	64
C. M. H. Molinard, weaving machinery	64
G. Littlewort, clocks and watches	64
M. M'Gregor, cotton machinery	64
J. Jones, do.	64
M. Bower and G. Blyth, saddles	64
J. B. Pleney, brickmaking	64
Ja. Jo. Hartley, glass-making	64
J. Stanley and J. Walmsley, furnaces	64
A. Stone, power-loom	64
G. G. Carey, hat-making	64
J. Hearle, engine-pumps	159
J. Gibbs, carriages	159
S. Bagshaw, water-filter	159
P. R. Jackson, hydraulic presses	159
J. Walton, woollen machinery	159
D. R. Long, curing meat	159
J. M. Cramer, steam-engine	159
L. W. Wright, paper machine	159
C. de Bergne, spinning machinery	159
E. G. Giles, engraving	159
S. Garner, multiplying engravings	159
W. Crofts, bobbin-net machinery	159
W. Wells, file-cutting machine	159
R. Whiteside, steam-carriages	159
Alex. Craig, steam-engine	159
J. Lutton, castors	159
R. J. Barlow, springs	159
J. Couch, ships' channels	159
J. T. Slade, metallic sheathing	159
J. Donkin, paper-machinery	159
F. A. Bernhardt, warming and airing	223
W. A. Noble, steam-engine	223
J. Hudson, block-printing	223
W. Ranger, artificial stone	223
J. West, forges	223
Ed. Massey, sounding machine	223
R. Rettfort, physiognotype	223
J. Hansom, improved vehicle	223
J. Ferguson, cloth-dressing	223
El. Galloway, steam-engine	223
H. Stothert, ships' hearths	223
J. Smith, chisels	223
R. Beart, brick-machine	223
Wm. Crofts, bobbin-net machinery	223
R. Sinister, steel pens	224
P. Fairbairn, spinning machinery	224
J. Browne, levelling instrument	224
A. Smith, ships' rigging	286
J. Stewart, piano-fortes	286
A. Shanks, preparation of hemp	286
J. Cherry, bedsteads	286
W. Houston, type-founding	286
J. Streets and T. Whiteley, warp-machinery	286
J. J. Tucker, tea-urns	287
J. Day, railways	287
W. E. Wright, tea-urns	415
J. Gibbs and J. Gatley, cutting wood	415
W. Morgan, steam-engine	415
J. Budd, cloth printing	415
Is. Dodd, cutting wood	415
B. and J. Cook, bed and mattresses	415
J. Bethell, diving apparatus	416
T. Roberts, ship-building	416
C. Cleveland, pens and penholders	416
Jas. Halstead, paddle-wheel	416
Jas. Leeming, water-wheel	416
R. Hill, letter-press printing	416
E. Norris, letter-press printing	416
T. Alcock, bobbin-net machinery	416
J. Hendrey, flooring	416
Jos. Price, railway lock	416
S. Burrell, button-machinery	416
S. Slocum, nail-making	416
Kay Pendleton, heckling machine	479
J. H. Hallett, cock or taps	479
W. Aitkin, carriages	479
P. S. Hynes, wheels and axletrees	479
J. Aldous, steam-engine	479
W. Newton, substitute for flax and hemp	479
R. Prosser, nail-machine	479
W. Davis, cloth-dressing	479

	PAGE
J. T. Beale steam engine	479
J. Levers and J. Pedders, bobbin-net lace machinery	479
F. L. H. Danchell, piano-fortes	479
R. Wolfe, piano-fortes	479
T. F. Bergin, railway carriages	479
J. Prince, paper-making	479
J. J. C. Sheridan, fermenting	479
H. Hendriks, dying	479
J. Butters Bacon, locomotive steam-carriages	479
W. Hale, steam-boiler	479
W. Newton, preservation of milk	479
R. Jupe, expanding table	479
J. Sylvester, heating	479
W. B. Adams, wheels	479
W. Church, locomotive machine	479
R. Hill, locks and staples	479
A. Smith, printing machine	479
J. Hunter, stone-cutting	479
H. W. Wood, oil-expressing	479
W. Weeks, cloth-dressing	479
J. Barker, umbrellas and parasols	479
Berrie and Anderson, heddles	479
J. Brunton, gas-retorts	479
W. Honston, letter-press printing	479

AMERICAN.

S. R. Packhurst, cloth-dressing machine	13
C. Bonnycastle, propelling boats	14
E. Pearce, making potash	11
N. T. Davis, weathercock-wheel	15
J. Riley, fire-engine branch-pipes	94
G. Burr, quick tanning	95
G. Reynolds, feather-dressing	95
J. H. Haggenmacker, imitation silver	96
G. W. Eddy, safety-boat	109
J. Ames, paper-cutting machine	110
Ingham and Davis, endless steam-screws	110
J. Truman, cylinder paper-machine	110
E. Bourne, colouring lamp-oil	204
R. Jarvis, ventilation of ships	205
Sykes and Conradt, wool-spinner	205
J. Bateman, bookbinders' cutting machine	205
N. S. Canfield, hat-block	206
J. Kinman, shouldering weights	206
O. R. Broyles, extricating horses from traces	206
J. Shaw, percussion pistol-whip	206
W. M. Eldridge, water-wheel	206
A. Clark, gridiron	206
Z. Allen, steam-engine	207
A. B. Newton, cementation	207
J. Marck, self-igniting cigar	284
A. S. Dawley, throttle-valve	284
S. Argell, account file	284
J. Glenn, tempering edge-tools	285
E. M. Chaffee, water-proof shoes	285
C. Evans, prevention of steam explosions	285
Heirs of J. Eastman, horse-power	286

Errat

P. 176, col. 2, l. 11 from the bottom, for "choke' rea "cholic."
P. 447, col. 2, l. 14 from the bottom, for "geometrically" read "geodesically."

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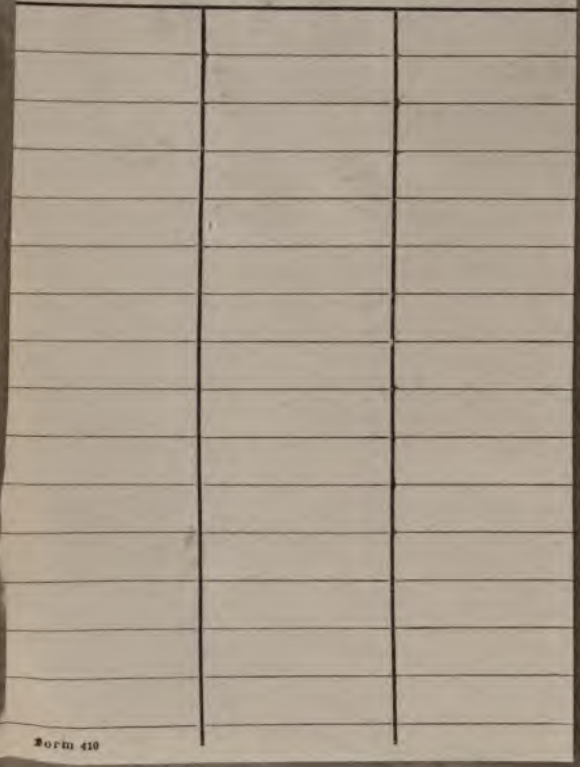
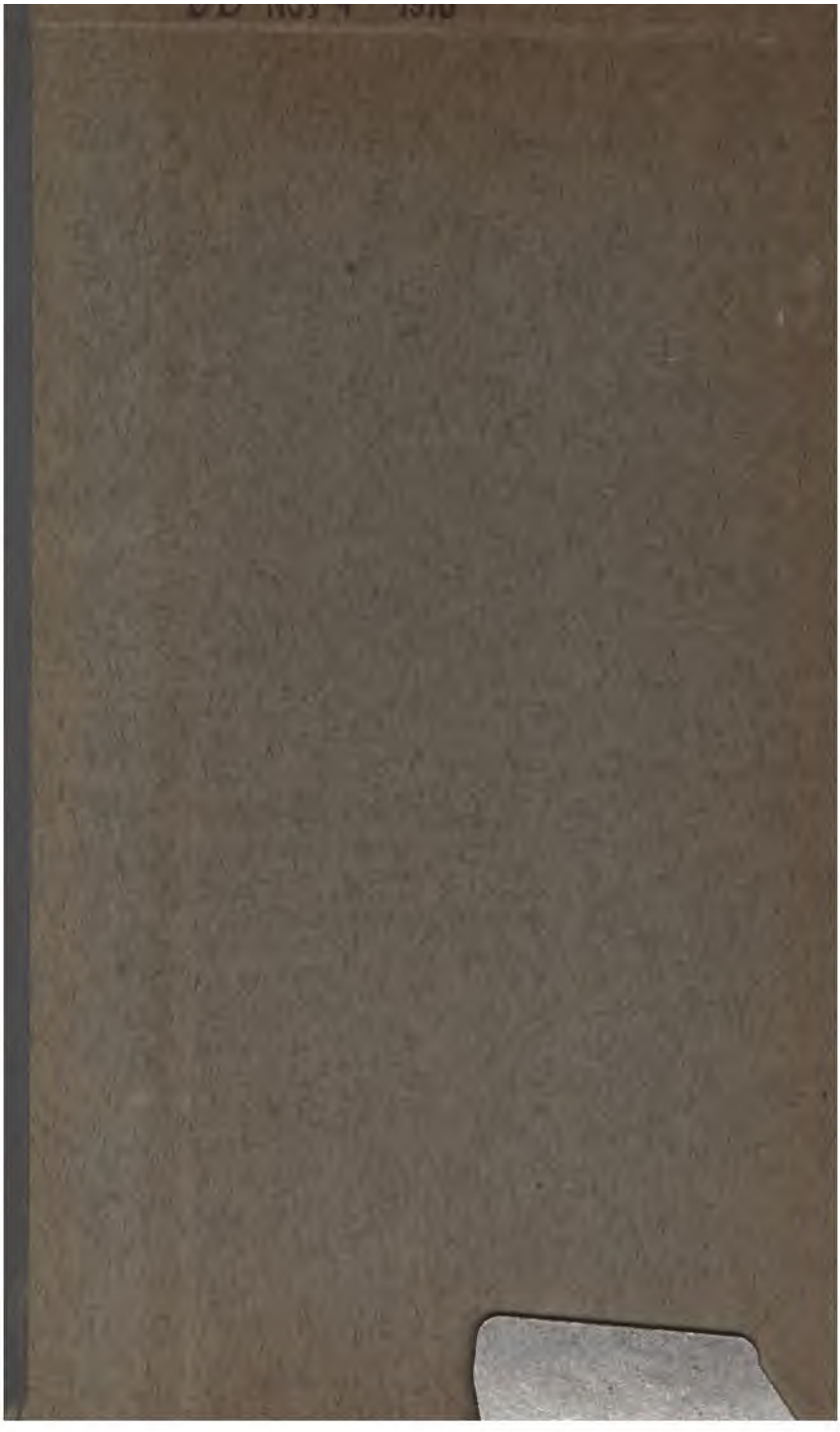
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